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ARMY ARMAMENT MATERIEL READINESS COMMAND ROCK ISLAND --ETC F/G 5/1
TERMINATION LIABILITY CUFV: STUDY.(U)

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TERMINATION LIABILITY CURVE STUDY



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PREPARED BY

OFFICE OF THE COMPTROLLER
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See 1473

APRIL 1977

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ROCK ISLAND, ILLINOIS 61201

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ANNEX - Regression Plots/Data Sample Detail

1. INTRODUCTION

The US Government traditionally has recognized the need for prompt payments to supplying contractors, including making provisions for progress payments against costs incurred where the leadtimes or dollar investments involved could adversely affect the contractors' financial resources. It also has been US Army policy to pre-finance from Army appropriations the procurement of material for foreign military sales (FMS) customers. The Army appropriations are then reimbursed from centrally controlled customer deposit (trust) funds.

With the dramatic increase in FMS business in recent years, it is increasingly important that customer deposit funds are available for timely reimbursement to Army appropriations. Failure to provide timely reimbursements could seriously compromise the integrity of the basic Army programs. To minimize this possibility, procedures were established providing for customer deposit schedules whereby the customer would be advised of the amounts to be deposited quarterly to cover projected contractor costs incurred for the period. The quarterly customer deposit schedules are to be developed on the principle of "termination liability" which, in essence, is the costs incurred by the contractor during a given period incident to the goods or services being produced. Note that in this context, termination liability costs normally will not be synonymous with contractor billings for the period due to cash holdbacks or other unbilled costs incurred. Further (notwithstanding the semantics), termination liability costs normally will not include the nonrecurring follow-on costs incident to actual termination for convenience of the Government (costs of closing production lines, layaway, severance pay, etc.). These costs would be applied only when the decision to terminate has been implemented.

2. PURPOSE

Message, DRCCP-EV, Headquarters, US Army Materiel Development and Readiness Command (DARCOM), 151459Z Mar 77, subject: Termination Liability Curves, requested that Headquarters, US Army Armament Materiel Readiness Command (ARRCOM), develop and submit command-peculiar, commodity-oriented termination liability tables for review by higher authority. The purpose of this study was to develop the requested ARRCOM commodity-oriented termination liability table(s) for possible use in lieu of existing DOD termination liability tables.

3. SCOPE OF THE STUDY

The study was conducted on the basis of analyzing a final cross-section selection of 32 ARRCOM commodity-oriented procurements shown on page 6. Primary effort was made to select samples providing actual contractor

costs incurred over time consistent with the concepts of termination liability expressed in paragraph 1 above. However, seven of the samples are based upon fixed price delivery billings recognizing that some portion of the ARRCOM procurements for FMS customers will be on that basis. To the extent identifiable, significant one-time nonrecurring investments were excluded from the data analysis to preclude inordinate distortion of initial or final costs incurred patterns. (NOTE: Use of termination liability tables in computing customer payment schedules is primarily applicable to recurring production costs; with provision for significant nonrecurring production costs being a separate part of the computation. Accordingly, the termination liability table developed in this study was constructed to exclude significant nonrecurring production costs.) Each contract was analyzed to determine the progressive percentages of time and cost completions (Time = Variable X, Cost = Variable Y). These data were then processed through a regression analysis screening program (12 regression forms) to determine individual contract and/or composite commodity category "best-fit" regressions. A best-fit composite ammunition/armament regression was then used to compute the ARRCOM termination liability table (Percent of Termination Liability for Various Leadtimes) shown on page 7.

4. STUDY RESULTS

a. Sample selection and data collection. The initial data collection was accomplished on 42 contracts/orders with aggregate total dollar value of \$237,153,729. Screening of these samples resulted in deleting ten items (nonrepresentative conditions, duplicative samples, etc.) leaving 32 samples with aggregate total dollar value of \$228,299,264 for the study analysis. Current ARRCOM procurement appropriation records indicate an approximate 3:1 ratio of ammunition to armament procurement obligation authority. Accordingly, 8 armament and 24 ammunition samples were included in the analysis. A FY 75 ammunition inflation study performed by this command indicated approximate ammunition component weighting factors of 12% for small arms (SA), 48% for metal parts (MPTS), 11% for propellants and explosives (P&E), 21% for load/assemble/pack (LAP), and 8% for other. The samples used in the final analysis were selected to provide a similar cross-section representation as follows:

| <u>Item</u> | <u>No. of Samples</u> | <u>Amount</u> |
|---------------|-----------------------|----------------------|
| Ammo-MPTS | 10 | \$ 67,477,193 |
| Ammo-P&E | 3 | 43,147,410 |
| Ammo-LAP | 5 | 4,459,948 |
| Ammo-SA | 3 | 15,362,478 |
| Ammo-other | 3 | 5,500,071 |
| Ammo-Subtotal | <u>24</u> | <u>\$135,947,100</u> |
| Armament | 8 | 92,352,164 |
| TOTALS | <u>32</u> | <u>\$228,299,264</u> |

Nineteen of the selected samples were commercial vendor fixed price contracts. Twelve of these included progress payment reporting which provided contractor costs incurred data over time consistent with the termination liability concepts of this study. For the remaining 7 commercial contracts, the mid-month or end-of-month date immediately preceding delivery was used as the cost incurred date for computing elapsed days from contract award.

The remaining 13 selected samples were individual orders under the single operating (cost plus type) contract at the individual Government-owned, contractor-operated (GOCO) Army Ammunition Plants (AAP's). The monthly Summary of Orders and Cost of Deliveries reports provided the monthly costs incurred data used for analysis. These reports include identification of material inventories or other costs committed, but not yet applied, to an order as a potential cost incurred liability. It is a normal circumstance to find multiple orders concurrently in process for a single product at the mission AAP at any given time. Hence, the order sample selected is a representation of, rather than a complete analysis of, any given product item. In many cases, there were periods of apparent order (cost) inactivity for a variety of reasons (e.g., priority of other orders for the product, priority of other product lines, temporary production suspension, etc.) even though mission function production continued at the AAP. To preclude undue distortion of the elapsed days/cumulative cost relationship in these cases, the computation of elapsed days for extended periods of order inactivity was adjusted to equivalent elapsed days had the order remained in continuous production.

Elapsed days (from contract award or order start) and the related cumulative costs data are shown in the individual sample data sheets beginning on page 14.

b. Data Analysis. The elapsed days and cumulative costs incurred data for the individual samples were converted to percentages of time and cost completions (variables X and Y, respectively). The percentage of completion data was then processed through a two-variable, regression screening program to determine individual sample and composite sample "best-fit" regressions. The screening process included the following regression forms:

| <u>Form No.</u> | <u>Regression Form</u> |
|-----------------|----------------------------|
| 1 | $Y = A + BX$ |
| 2 | $Y = A + B (\ln X)$ |
| 3 | $\ln Y = A + BX$ |
| 4 | $Y = 1/(A + BX)$ |
| 5 | $Y = AX^B$ |
| 6 | $\sqrt{Y} = A + BX$ |
| 7 | $Y = A + B\sqrt{X}$ |
| 8 | $\sqrt{Y} = A + B\sqrt{X}$ |
| 9 | $Y^2 = A + BX$ |
| 10 | $Y^2 = A + BX^2$ |
| 11 | $Y = A + BX + CX^2$ |
| 12 | $Y = A + BX + CX^2 + DX^3$ |

The best fit regression form with related coefficients of determination and variation are indicated on the individual and composite sample regression plots shown in subsequent pages of the study. Comparative plotting of the best fit regressions for composite ammunition products, composite armament products, composite ammunition/armament, and the DOD termination liability table plot are shown on page 8. The composite ammunition regression indicated a slightly accelerated cost incurred rate in the first 20-25% of the order life and then tended to level out as the order progressed. The composite armament regression indicated a relatively slow cost incurred rate initially, an accelerating rate from approximately 10 to 45% of order life, with only slight increase in the cost incurred rate thereafter. The composite ammunition/armament regression is essentially linear.

The slightly accelerated initial cost incurred rate in the early life of ammunition product orders represents a combination of two partially off-setting influences. On the one hand, regressions of the GOCO AAP contract data are influenced by the peculiarities of the GOCO AAP accounting practices whereby material procurements must be immediately charged to applicable orders. Frequently, the material procurements for several orders may be initially charged to one order (as a "carrier") for accounting convenience, and subsequently the material costs are redistributed from the carrier order to other applicable orders. The carrier order obviously will show an exaggerated initial material cost until charges are redistributed. Even after redistributions, the individual orders will continue to carry the material commitment cost although the material still may not have been applied to work-in-process. This procedure recognizes the potential liability involved if the order is cancelled and the material cannot be reapplied. By contrast, the costs incurred for ammunition metal parts procured from commercial contract sources tends to include only actual costs applied to work-in-process and excludes material inventory commitments which have not actually been applied. The net result of the combined ammunition regression (combined GOCO AAP and metal parts orders) tended to indicate the slightly prevailing influence of the GOCO AAP material commitment accounting procedures in the early phases of order life.

The samples used for the armament products regressions are all commercial contractors whose accounting practices tended to include only costs actually applied to work-in-process as costs incurred (excluding unissued material commitments). The samples represent established contractors who have had on-going production with the same or similar products. Hence, the cost incurred patterns tend to show an acceleration through the initial production build-up to sustaining production rates and then a leveling out. A somewhat different pattern might occur in the case of procuring a new or out-of-production item, or going to a new contract source; however, appropriate samples of these conditions were not available for this study.

No attempt has been made to normalize the raw cost data used in this study for the effects of inflation over time. No effective method was found on which to allocate the effects of inflation even in those cases where escalation clauses were contained in the contract. Accordingly, use of this study should be with due consideration that regression results may be in some degree affected by inflation.

c. Conclusions. Comparisons of the ARRCOM composite regression plots with the DOD termination liability table are shown on page 8. The ARRCOM commodity-peculiar termination liability table, based upon composite ammunition/armament products regression is shown on page 7. The table and comparative plots have been forwarded to higher authority for review and consideration for possible application.

The ARRCOM composite regressions (ammunition products, ammunition products, and combined ammunition/armament products) are regarded as valid representatives of costs incurred consistent with the connotation of termination liability. The principal difference between the ammunition and armament cost incurred patterns appears to occur in the first 40-45% of the order life; and in great part, is related to the peculiarity of including material commitments in the GOCO AAP order costs.

Irrespective of the differences between ammunition and armament concepts of costs incurred, it is observed that even in the case of progress payments, the Government's payments to the contractor during much of the contract life would not exceed the maximum standard progress payment percentages of costs incurred prescribed by the Armed Services Procurement Regulation (small business - 85%, large business - 80%). Hence, termination liability tables based upon cost incurred patterns would tend to have an inherent "reserve factor" built into the customer payment schedules during much of the order life.

As may be noted from the comparative termination liability plots, the DOD termination liability table and the ARRCOM composite armament products regression plots are essentially the same during the first 40% of time. As far as can be determined, the DOD termination liability table heretofore used has historically provided adequate reimbursement to the Army. However, it is not known how effective the DOD termination liability table has been in maintaining adequate reserves in the customer trust fund accounts. Similarly, it is not known what effect substituting a termination liability table based upon composite armament products regression might have on the customer trust fund accounts, particularly during the last 60% of order time.

SUMMARY OF COMMODITY ITEM SAMPLE SELECTIONS

| Sample No | Contract Number | Contract Type 1/ | Commodity Item | Category | Elapsed Days 2/ | Value |
|-----------|-----------------|------------------|---|------------|-----------------|----------------|
| 1 | DAA03-70-C-0044 | FP (PP) | M107, M110 Howitzers; M578 Rec. Veh. | Armament | 1,169 | \$ 40,767,686 |
| 2 | DAA03-69-C-0042 | FP (PP) | Guns, Auto. Aircraft, 7.62mm, GAN-2BA | Armament | 608 | 3,926,288 |
| 3 | DAA03-68-C-0048 | FP (PP) | Pifles, 5.56mm, M16A1 | Armament | 713 | 41,138,610 |
| 4 | DAA09-76-C-2003 | FP | M6, 7.62mm, Fixed, M60E2 w/Equip | Armament | 261 | 1,095,344 |
| 5 | DAA03-73-A-0150 | FP (PP) | Gun, Auto., 20mm, M197 | Armament | 494 | 303,642 |
| 6 | DAA03-73-A-0150 | FP (PP) | Gun, Auto., 20mm, M61A1 | Armament | 784 | 3,539,498 |
| 7 | DAA09-74-C-2029 | FP | Tripod, M6, M122 | Armament | 942 | 1,104,364 |
| 8 | DAA09-76-C-6155 | FP (PP) | Power Supply, Armament Subsystem | Armament | 349 | 476,732 |
| | SUBTOTAL | | | | | \$ 92,352,164 |
| 9 | DAA09-72-C-0064 | FP (PP) | Projectile, 175mm, HE, M437 | Ammo-MPTS | 447 | \$ 14,380,009 |
| 10 | DAA09-72-C-0360 | FP (PP) | Booster, M125A1, MPTS Assy w/M17 Det. | Ammo-MPTS | 549 | 4,459,171 |
| 11 | DAA09-73-C-0267 | FP | Containers, Fiber f/105mm | Ammo-Other | 487 | 3,408,416 |
| 12 | DAA09-73-C-4002 | FP | M3 Bandoleers/Primer Percussion M2882 | Ammo-MPTS | 380 | 2,781,800 |
| 13 | DAA09-75-C-0047 | FP | Fuze, M550, P1RD | Ammo-MPTS | 162 | 1,900,871 |
| 14 | DAA09-73-C-0201 | FP (PP) | Projectile, HE, 155mm, M107 | Ammo-MPTS | 427 | 20,561,227 |
| 15 | DAA09-73-C-0048 | FP | Projectile, 8", HE, M106 | Ammo-MPTS | 492 | 8,325,748 |
| 16 | DAA09-72-C-0190 | FP (PP) | Projectile, 105mm, APDS-T, M392A1 | Ammo-MPTS | 732 | 7,081,257 |
| 17 | DAA09-75-C-0048 | FP | Case, Cart., 105mm, M1484 | Ammo-MPTS | 244 | 5,907,516 |
| 18 | DAA09-72-C-0047 | FP (PP) | Fuze, PD, M524A6 | Ammo-MPTS | 518 | 1,248,339 |
| 19 | DAA09-73-C-0187 | FP (PP) | Cartridge Initiator M285 | Ammo-MPTS | 775 | 831,255 |
| 20 | DAA09-71-C-0316 | GNCO | 5.56mm, Blank, M200, Ctn | Ammo-SA | 579 | 5,994,830 |
| 21 | DAA09-71-C-0316 | GNCO | 7.62mm, Ball M90 & Tracer M62, 9/1 | Ammo-SA | 427 | 5,961,504 |
| 22 | DAA09-71-C-0316 | GNCO | Cal. 50 Tracer M117, Bulk | Ammo-SA | 427 | 3,406,064 |
| 23 | DAA09-72-C-0170 | GNCO | Add. Jacket, M1 f/Chn. Prop 175mm M86A2 | Ammo-Other | 152 | 294,531 |
| 24 | DAA09-72-C-0170 | GNCO | Chn. Prop. M2 f/8" | Ammo-Other | 245 | 1,797,124 |
| 25 | DAA09-73-C-0079 | GNCO | Comp. B | Ammo-P&E | 304 | 18,313,099 |
| 26 | DAA09-71-C-0329 | GNCO | Propellant, M1 SB HP f/105mm | Ammo-P&E | 334 | 5,798,438 |
| 27 | DAA09-71-C-0329 | GNCO | Propellant, M1 SB HP f/155mm | Ammo-P&E | 273 | 19,035,873 |
| 28 | DAA09-71-C-0265 | GNCO | LAP 105mm M314A3 | Ammo-LAP | 213 | 521,154 |
| 29 | DAA09-72-C-0300 | GNCO | Chq. & Booster f/XH70 Mine | Ammo-LAP | 427 | 280,000 |
| 30 | DAA09-71-C-0288 | GNCO | LAP, 60mm, HE, M49A4 w/Fuze | Ammo-LAP | 183 | 1,644,339 |
| 31 | DAA09-71-C-0289 | GNCO | Projectile, 155mm M483 | Ammo-LAP | 305 | 1,860,000 |
| 32 | DAA09-71-C-0289 | GNCO | Fuze, BD, M534 | Ammo-LAP | 213 | 154,455 |
| | SUBTOTAL | | | | | \$ 135,947,100 |
| | GRAND TOTAL | | | | | \$ 228,299,264 |

Footnotes:

1/ FP = Fixed price contracts including firm fixed price, fixed price w/escalation or incentive provisions; (PP) = Includes progress payment contract provisions; GNCO = Cost plus type contracts at Government-owned, contractor-operated Army Ammunition Plants (AAP's)

2/ Elapsed days in GNCO contracts were adjusted to compensate for periods of order inactivity or for extended delays following final deliveries to effect final accounting adjustments.

PERCENT OF TERMINATION LIABILITY FOR VARIOUS LEADTIMES

(Composite Ammunition/Armament Regression)

| MONTHS UNTIL DELIVERY | LEADTIMES IN MONTHS | | | | | | | | | | | | | | | | |
|-----------------------------|---------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--|--|
| | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 | 30 | 33 | 36 | 39 | 42 | 45 | 48 | | |
| 0 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | | |
| 1 | 61.14 | 86.84 | 89.69 | 91.40 | 92.54 | 93.36 | 93.97 | 94.45 | 94.83 | 95.14 | 95.40 | 95.62 | 95.81 | 95.97 | 96.11 | | |
| 2 | 61.14 | 75.45 | 81.14 | 84.56 | 86.64 | 88.46 | 89.69 | 90.64 | 91.40 | 92.02 | 92.54 | 92.98 | 93.36 | 93.68 | 93.97 | | |
| 3 | 47.21 | 64.11 | 72.61 | 77.72 | 81.14 | 83.58 | 85.41 | 86.84 | 87.98 | 88.91 | 89.69 | 90.35 | 90.91 | 91.40 | 91.83 | | |
| 4 | 30.51 | 52.82 | 64.11 | 70.91 | 75.45 | 78.70 | 81.14 | 83.04 | 84.56 | 85.80 | 86.84 | 87.71 | 88.46 | 89.12 | 89.69 | | |
| 5 | 14.19 | 41.61 | 55.64 | 64.11 | 69.77 | 73.83 | 76.81 | 79.24 | 81.14 | 82.69 | 83.99 | 85.08 | 86.02 | 86.84 | 87.55 | | |
| 6 | 0 | 47.21 | 57.33 | 64.11 | 68.96 | 72.61 | 75.45 | 77.72 | 79.59 | 81.14 | 82.45 | 83.58 | 84.56 | 85.41 | 86.11 | | |
| 7 | 19.56 | 38.83 | 50.58 | 58.46 | 64.11 | 68.36 | 71.66 | 74.31 | 76.48 | 78.29 | 79.82 | 81.14 | 82.28 | 83.27 | 84.14 | | |
| 8 | 8.93 | 30.51 | 43.85 | 52.82 | 59.27 | 64.11 | 67.88 | 70.91 | 73.38 | 75.45 | 77.20 | 78.70 | 80.00 | 81.14 | 82.28 | | |
| 9 | 0 | 22.28 | 37.16 | 47.21 | 54.43 | 59.87 | 64.11 | 67.51 | 70.29 | 72.61 | 74.58 | 76.26 | 77.72 | 79.00 | 80.00 | | |
| 10 | 14.19 | 30.51 | 41.61 | 49.61 | 55.64 | 60.34 | 64.11 | 67.20 | 69.77 | 71.96 | 73.83 | 75.45 | 76.87 | 78.18 | 79.59 | | |
| 11 | 0 | 16.48 | 28.38 | 34.20 | 40.50 | 45.68 | 50.01 | 53.69 | 56.85 | 59.59 | 61.59 | 63.85 | 65.85 | 67.72 | 69.51 | | |
| 12 | 0 | 17.40 | 30.51 | 40.02 | 47.21 | 52.82 | 57.33 | 61.03 | 64.11 | 66.94 | 69.34 | 71.39 | 73.18 | 74.74 | 76.11 | | |
| 13 | 11.02 | 25.01 | 35.25 | 43.01 | 49.08 | 53.95 | 57.95 | 61.28 | 64.11 | 66.54 | 68.64 | 70.48 | 72.08 | 73.58 | 75.00 | | |
| 14 | 0 | 14.19 | 25.01 | 38.83 | 45.34 | 50.58 | 54.87 | 58.46 | 61.50 | 64.11 | 66.37 | 68.36 | 70.00 | 71.50 | 73.00 | | |
| 15 | 0 | 14.19 | 25.01 | 38.83 | 45.34 | 50.58 | 54.87 | 58.46 | 61.50 | 64.11 | 66.37 | 68.36 | 70.00 | 71.50 | 73.00 | | |
| 16 | 8.93 | 21.11 | 30.51 | 37.90 | 43.85 | 48.74 | 52.82 | 56.29 | 59.27 | 61.85 | 64.11 | 66.11 | 67.88 | 69.51 | 71.14 | | |
| 17 | 0 | 16.48 | 28.38 | 34.20 | 40.50 | 45.68 | 50.01 | 53.69 | 56.85 | 59.59 | 61.59 | 63.85 | 65.85 | 67.72 | 69.51 | | |
| 18 | 0 | 11.92 | 22.28 | 30.51 | 37.16 | 42.63 | 47.21 | 51.09 | 54.43 | 57.33 | 59.87 | 62.08 | 64.11 | 66.11 | 68.11 | | |
| 19 | 7.46 | 18.21 | 26.84 | 33.83 | 39.59 | 44.41 | 48.50 | 52.02 | 55.08 | 57.75 | 60.00 | 62.08 | 64.11 | 66.11 | 68.11 | | |
| 20 | 0 | 14.19 | 23.19 | 30.51 | 36.55 | 41.61 | 45.92 | 49.61 | 52.82 | 55.64 | 58.46 | 61.28 | 64.11 | 66.37 | 68.36 | | |
| 21 | 0 | 10.23 | 19.56 | 27.20 | 33.52 | 38.83 | 43.33 | 47.21 | 50.58 | 53.53 | 56.29 | 58.89 | 61.28 | 63.53 | 65.85 | | |
| 22 | 6.38 | 15.97 | 23.92 | 30.51 | 36.55 | 41.61 | 45.92 | 49.61 | 52.82 | 55.64 | 58.46 | 61.28 | 64.11 | 66.37 | 68.36 | | |
| 23 | 2.71 | 12.42 | 20.65 | 27.50 | 33.27 | 38.18 | 42.61 | 46.09 | 49.31 | 52.33 | 55.08 | 57.75 | 60.00 | 62.08 | 64.11 | | |
| 24 | 0 | 18.93 | 17.40 | 24.51 | 30.51 | 35.25 | 39.59 | 44.41 | 48.50 | 52.02 | 55.08 | 57.75 | 60.00 | 62.08 | 64.11 | | |
| 25 | 5.54 | 14.19 | 21.54 | 27.75 | 33.06 | 37.63 | 41.61 | 45.92 | 49.61 | 52.82 | 55.64 | 58.46 | 61.28 | 64.11 | 66.37 | | |
| 26 | 2.33 | 11.02 | 18.58 | 25.01 | 30.51 | 35.25 | 39.59 | 44.41 | 48.50 | 52.02 | 55.08 | 57.75 | 60.00 | 62.08 | 64.11 | | |
| 27 | 0 | 7.90 | 15.65 | 22.28 | 27.96 | 32.88 | 37.16 | 41.61 | 45.92 | 49.61 | 52.82 | 55.64 | 58.46 | 61.28 | 64.11 | | |
| 28 | 4.88 | 4.88 | 12.74 | 19.56 | 25.43 | 30.51 | 35.25 | 39.59 | 44.41 | 48.50 | 52.02 | 55.08 | 57.75 | 60.00 | 62.08 | | |
| 29 | 2.02 | 0 | 9.88 | 16.87 | 22.91 | 28.15 | 32.72 | 36.74 | 40.76 | 44.31 | 47.21 | 49.61 | 51.85 | 54.00 | 56.11 | | |
| 30 | 0 | 7.07 | 14.19 | 20.65 | 26.40 | 31.59 | 36.11 | 40.00 | 43.33 | 46.09 | 48.50 | 50.58 | 52.33 | 54.00 | 55.64 | | |
| 31 | 11.54 | 17.90 | 23.45 | 28.38 | 32.88 | 37.16 | 41.61 | 45.92 | 49.61 | 52.82 | 55.64 | 58.46 | 61.28 | 64.11 | 66.37 | | |
| 32 | 8.93 | 15.42 | 21.11 | 26.10 | 30.51 | 34.51 | 38.18 | 41.61 | 44.31 | 46.85 | 49.31 | 51.59 | 53.53 | 55.33 | 57.00 | | |
| 33 | 6.38 | 10.54 | 16.48 | 21.54 | 26.40 | 30.51 | 34.51 | 38.18 | 41.61 | 44.31 | 46.85 | 49.31 | 51.59 | 53.53 | 55.33 | | |
| 34 | 3.90 | 8.93 | 14.19 | 19.56 | 24.51 | 28.38 | 32.88 | 37.16 | 41.61 | 44.31 | 46.85 | 49.31 | 51.59 | 53.53 | 55.33 | | |
| 35 | 1.58 | 6.38 | 11.02 | 15.97 | 20.65 | 24.51 | 28.38 | 32.88 | 37.16 | 41.61 | 44.31 | 46.85 | 49.31 | 51.59 | 53.53 | | |
| 36 | 0 | 4.34 | 9.88 | 14.19 | 18.58 | 22.91 | 27.20 | 31.59 | 35.25 | 38.83 | 42.61 | 46.09 | 49.31 | 52.33 | 55.08 | | |
| 37 | 4.34 | 17.90 | 23.45 | 28.38 | 32.88 | 37.16 | 41.61 | 45.92 | 49.61 | 52.82 | 55.64 | 58.46 | 61.28 | 64.11 | 66.37 | | |
| 38 | 8.93 | 15.42 | 21.11 | 26.10 | 30.51 | 34.51 | 38.18 | 41.61 | 44.31 | 46.85 | 49.31 | 51.59 | 53.53 | 55.33 | 57.00 | | |
| 39 | 6.38 | 10.54 | 16.48 | 21.54 | 26.40 | 30.51 | 34.51 | 38.18 | 41.61 | 44.31 | 46.85 | 49.31 | 51.59 | 53.53 | 55.33 | | |
| 40 | 3.90 | 8.93 | 14.19 | 19.56 | 24.51 | 28.38 | 32.88 | 37.16 | 41.61 | 44.31 | 46.85 | 49.31 | 51.59 | 53.53 | 55.33 | | |
| 41 | 1.58 | 6.38 | 11.02 | 15.97 | 20.65 | 24.51 | 28.38 | 32.88 | 37.16 | 41.61 | 44.31 | 46.85 | 49.31 | 51.59 | 53.53 | | |
| 42 | 0 | 4.34 | 9.88 | 14.19 | 18.58 | 22.91 | 27.20 | 31.59 | 35.25 | 38.83 | 42.61 | 46.09 | 49.31 | 52.33 | 55.08 | | |
| 43 | 4.34 | 17.90 | 23.45 | 28.38 | 32.88 | 37.16 | 41.61 | 45.92 | 49.61 | 52.82 | 55.64 | 58.46 | 61.28 | 64.11 | 66.37 | | |
| 44 | 8.93 | 15.42 | 21.11 | 26.10 | 30.51 | 34.51 | 38.18 | 41.61 | 44.31 | 46.85 | 49.31 | 51.59 | 53.53 | 55.33 | 57.00 | | |
| 45 | 6.38 | 10.54 | 16.48 | 21.54 | 26.40 | 30.51 | 34.51 | 38.18 | 41.61 | 44.31 | 46.85 | 49.31 | 51.59 | 53.53 | 55.33 | | |
| 46 | 3.90 | 8.93 | 14.19 | 19.56 | 24.51 | 28.38 | 32.88 | 37.16 | 41.61 | 44.31 | 46.85 | 49.31 | 51.59 | 53.53 | 55.33 | | |
| 47 | 1.58 | 6.38 | 11.02 | 15.97 | 20.65 | 24.51 | 28.38 | 32.88 | 37.16 | 41.61 | 44.31 | 46.85 | 49.31 | 51.59 | 53.53 | | |
| 48 | 0 | 4.34 | 9.88 | 14.19 | 18.58 | 22.91 | 27.20 | 31.59 | 35.25 | 38.83 | 42.61 | 46.09 | 49.31 | 52.33 | 55.08 | | |

TERMINATION LIABILITY PLOTS

Y AXIS (COST COMPLETION)

1.208 +

1.057 +

.906 +

.755 +

.604 +

.453 +

.302 +

.151 +

0

Explanation of Plots

- ARRCOM Ammunition Products Regression Plot
- ##### DOD Termination Liability Table Plot
- ooooo ARRCOM Ammunition Products Regression Plot
- ***** ARRCOM Composite (Ammunition/Armament) Regression Plot

X AXIS (TIME COMPLETION)

1.200

1.080

.960

.840

.720

.600

.480

.360

.240

.120

ANNEX

Regression Plots/Data Sample Details

FORM 8

Y AXIS (COST COMPLETION)

Composite-Ammunition/Armament
 Regression Form: $\sqrt{Y} = A + B\sqrt{X}$
 A = -.04716 B = 1.03843
 Coefficient of Determination: .74875
 Coefficient of Variation: .77711

1.870 +

1.683 +

1.496 +

1.309 +

1.122 +

.935 +

.748 +

.561 +

.374 +

.187 +

.150

.300

.450

.600

.750

.900

1.050

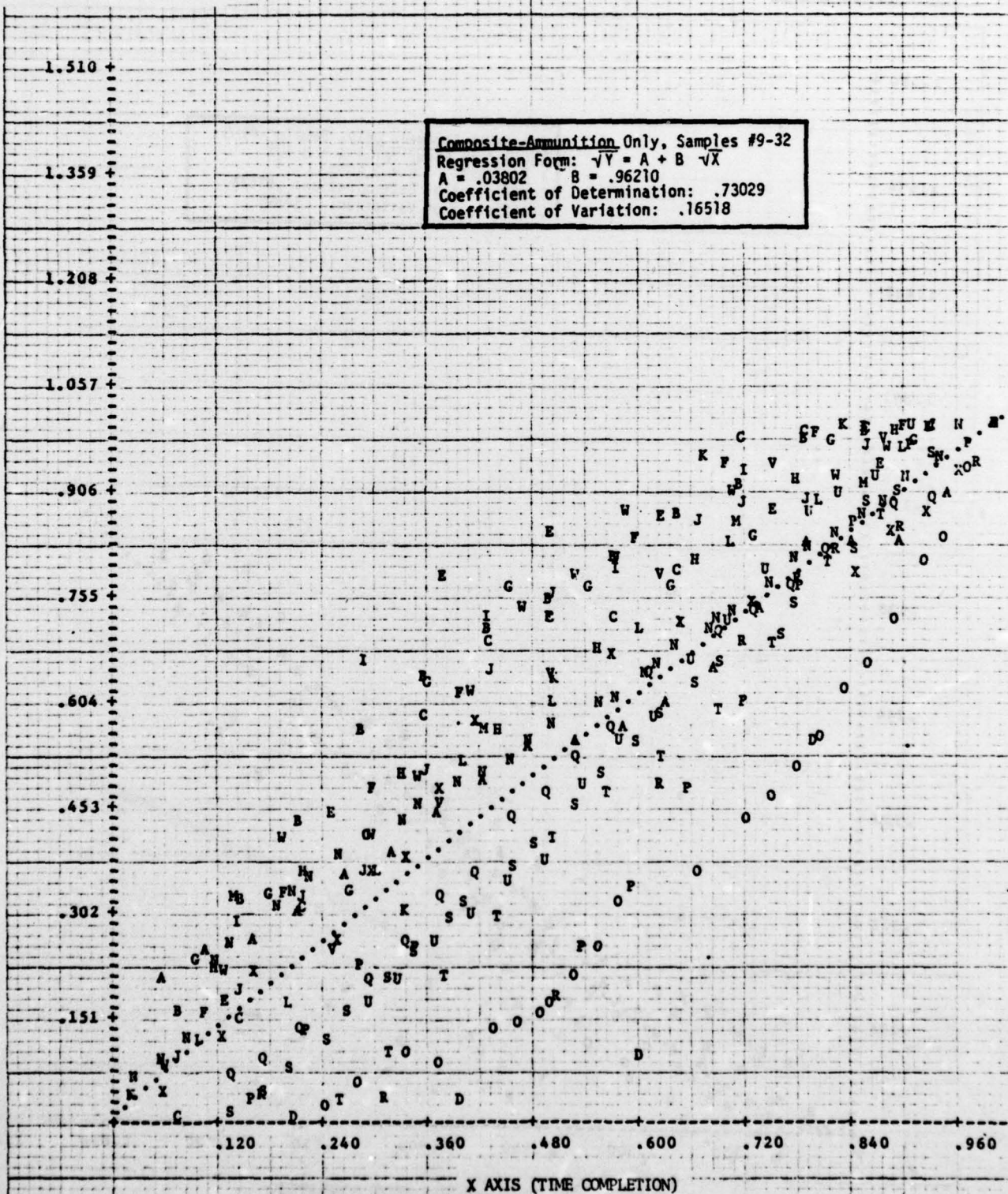
1.200

X AXIS (TIME COMPLETION)

FORM 8

Y AXIS (COST COMPLETION)

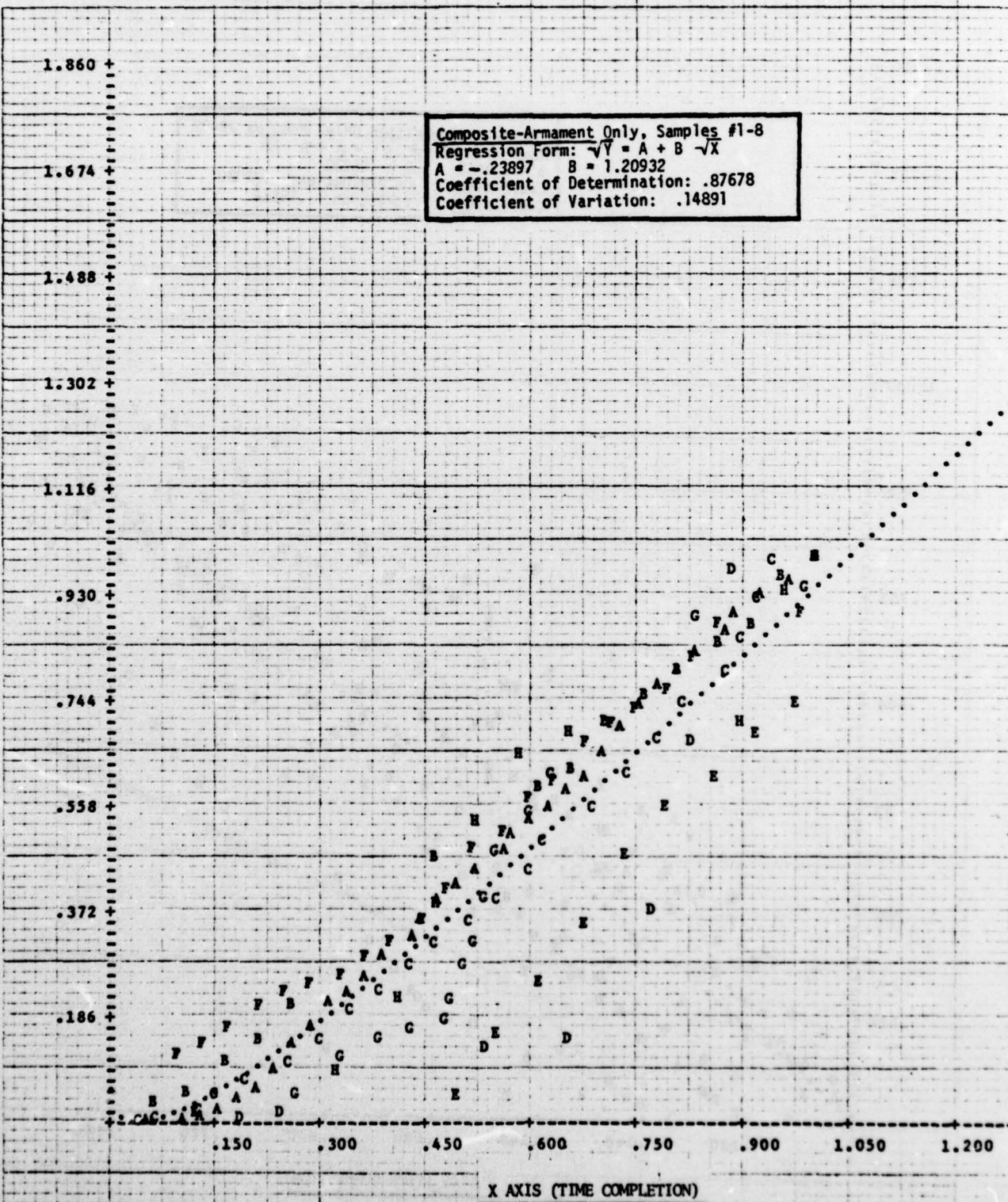
Composite-Ammunition Only, Samples #9-32
 Regression Form: $\sqrt{Y} = A + B \sqrt{X}$
 A = .03802 B = .96210
 Coefficient of Determination: .73029
 Coefficient of Variation: .16518



FORM 8

Y AXIS (COST COMPLETION)

Composite-Armament Only, Samples #1-8
 Regression Form: $\sqrt{Y} = A + B \sqrt{X}$
 A = -.23897 B = 1.20932
 Coefficient of Determination: .87678
 Coefficient of Variation: .14891



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SAMPLE: #1

CONTRACTOR: Bowen-McLaughlin-York Co. CONTRACT NO: DAAF03-70-C-0044

CONTRACT TYPE: FFP (Progress Payments)

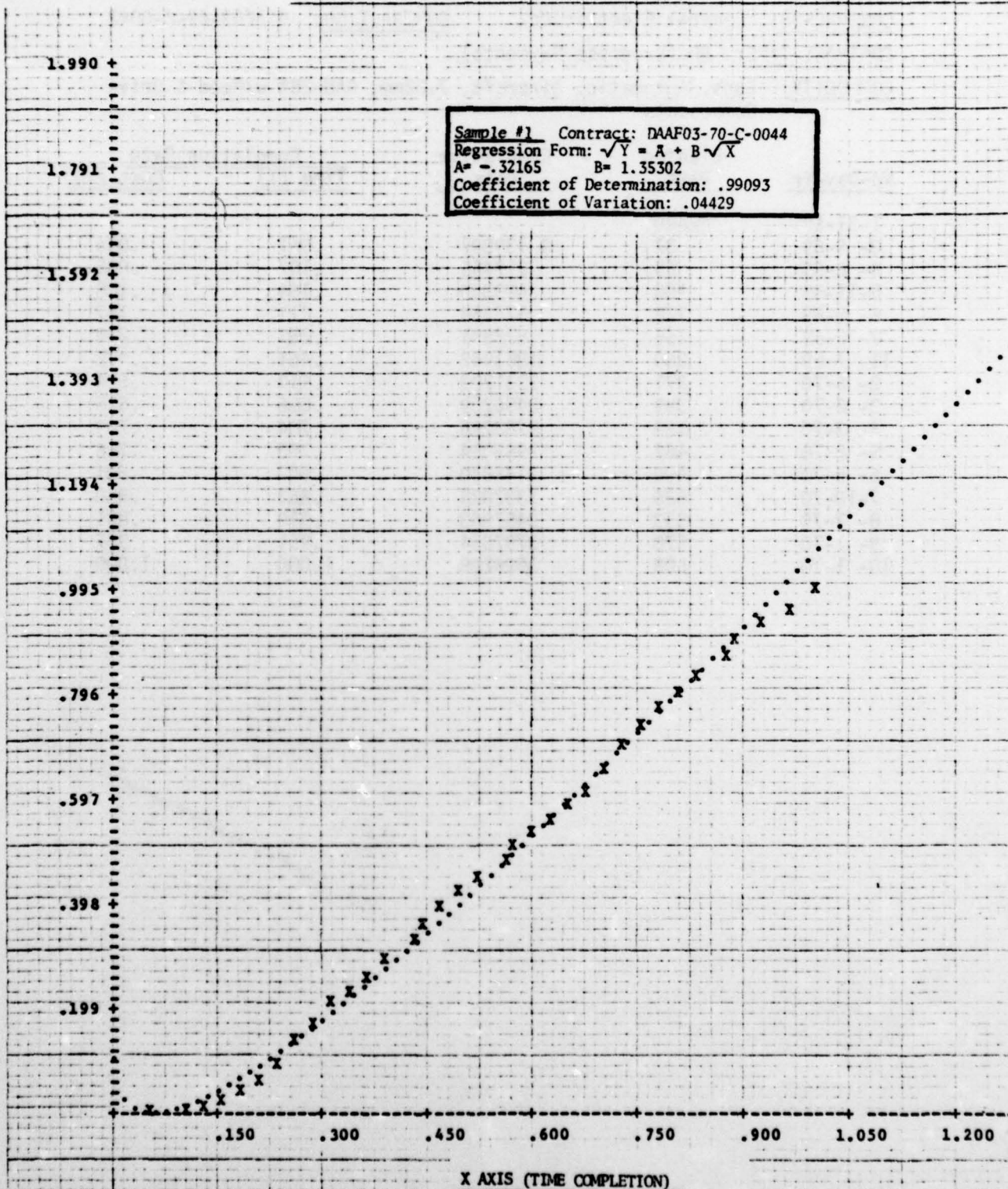
COMMODITY: M107-M110 SP Howitzers; M578 Recovery Vehicles

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 1- 2-70 | AWARD | | | |
| 2-28-70 | 58 | \$ 182458 | .050 | .004 |
| 4-30-70 | 119 | 285556 | .102 | .007 |
| 5-31-70 | 150 | 502732 | .128 | .012 |
| 6-30-70 | 180 | 990459 | .154 | .024 |
| 7-31-70 | 211 | 1752375 | .180 | .043 |
| 8-31-70 | 242 | 2568235 | .207 | .063 |
| 9-30-70 | 272 | 3882492 | .233 | .095 |
| 10-31-70 | 303 | 5759704 | .259 | .141 |
| 11-30-70 | 333 | 7001791 | .285 | .172 |
| 12-31-70 | 364 | 8715450 | .311 | .214 |
| 1-31-71 | 395 | 9468206 | .338 | .232 |
| 2-28-71 | 423 | 10579131 | .362 | .259 |
| 3-31-71 | 454 | 12075895 | .388 | .296 |
| 5-20-71 | 504 | 13510318 | .431 | .331 |
| 5-31-71 | 515 | 14754951 | .441 | .362 |
| 6-30-71 | 545 | 16106900 | .466 | .395 |
| 7-31-71 | 576 | 17269505 | .493 | .424 |
| 8-31-71 | 607 | 18350812 | .519 | .450 |
| 10-20-71 | 657 | 19684062 | .562 | .483 |
| 10-31-71 | 668 | 20842499 | .571 | .511 |
| 11-30-71 | 698 | 21901810 | .597 | .537 |
| 12-31-71 | 729 | 22807040 | .624 | .559 |
| 1-31-72 | 760 | 23967258 | .650 | .588 |
| 2-29-72 | 789 | 24898160 | .675 | .611 |
| 3-31-72 | 820 | 26750801 | .701 | .656 |
| 4-30-72 | 850 | 28574976 | .727 | .701 |
| 5-31-72 | 881 | 30145549 | .754 | .739 |
| 6-30-72 | 911 | 31551171 | .779 | .774 |
| 7-31-72 | 942 | 32653662 | .806 | .801 |
| 8-31-72 | 973 | 33954351 | .832 | .833 |
| 10-17-72 | 1,020 | 35474705 | .873 | .870 |
| 10-31-72 | 1,034 | 36774290 | .885 | .902 |
| 12-15-72 | 1,079 | 38074055 | .923 | .934 |
| 1-31-73 | 1,126 | 39094305 | .963 | .959 |
| 3-15-73 | 1,169 | 40767686 | 1.000 | 1.000 |

FORM 8

Y AXIS (COST COMPLETION)

Sample #1 Contract: DAAF03-70-C-0044
Regression Form: $\sqrt{Y} = A + B\sqrt{X}$
A = -.32165 B = 1.35302
Coefficient of Determination: .99093
Coefficient of Variation: .04429



SAMPLE: #2

CONTRACTOR: General Electric Co. CONTRACT NO: DAAF03-69-C-0042

CONTRACT TYPE: FP (Progress Payments)

COMMODITY: Guns, Automatic, Aircraft, 7.62mm, GAU-2BA w/Feed & Drive Components

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 1-31-69 | AWARD | | | |
| 3- 9-69 | 37 | \$ 139897 | .061 | .036 |
| 4- 6-69 | 65 | 217456 | .107 | .055 |
| 5-11-69 | 100 | 423330 | .164 | .108 |
| 6- 8-69 | 128 | 578354 | .211 | .147 |
| 7- 6-69 | 156 | 822891 | .257 | .210 |
| 11- 7-69 | 280 | 1851952 | .461 | .472 |
| 2- 6-70 | 371 | 2331723 | .610 | .594 |
| 3- 6-70 | 399 | 2456209 | .656 | .626 |
| 4- 3-70 | 428 | 2782796 | .704 | .709 |
| 5- 8-70 | 462 | 2968054 | .760 | .756 |
| 6- 5-70 | 490 | 3145070 | .806 | .801 |
| 7-10-70 | 525 | 3337023 | .863 | .850 |
| 8- 7-70 | 553 | 3457963 | .910 | .881 |
| 9- 1-70 | 578 | 3797854 | .951 | .967 |
| 10- 1-70 | 608 | 3926288 | 1.000 | 1.000 |

FORM 8

Y AXIS (COST COMPLETION)

Sample #2 Contract: DAAF03-69-C-0042
Regression Form: $\sqrt{Y} = A + B\sqrt{X}$
A = -.11042 B = 1.11872
Coefficient of Determination: .99670
Coefficient of Variation: .02486

1.920 +

1.728 +

1.536 +

1.344 +

1.152 +

.960 +

.768 +

.576 +

.384 +

.192 +

.150

.300

.450

.600

.750

.900

1.050

1.200

X AXIS (TIME COMPLETION)

SAMPLE: #3

CONTRACTOR: General Motors Corp.

CONTRACT NO: DAAF03-68-C-0048

CONTRACT TYPE: FFP (Progress Payments)

COMMODITY: Rifle, 5.56mm, M16A1

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 4-18-68 | AWARD | | | |
| 5-14-68 | 27 | \$ 181832 | .038 | .004 |
| 5-31-68 | 44 | 366381 | .062 | .009 |
| 7-15-68 | 89 | 967683 | .125 | .024 |
| 7-31-68 | 105 | 2140061 | .147 | .052 |
| 8-31-68 | 136 | 3184539 | .191 | .077 |
| 10-14-68 | 180 | 4419078 | .252 | .107 |
| 11-15-68 | 212 | 6081394 | .297 | .148 |
| 12-16-68 | 243 | 8233099 | .341 | .200 |
| 1-15-69 | 273 | 9693339 | .383 | .236 |
| 2-14-69 | 303 | 11479641 | .425 | .279 |
| 3-12-69 | 329 | 13112384 | .461 | .319 |
| 4-15-69 | 363 | 14747092 | .509 | .358 |
| 5-14-69 | 392 | 16383138 | .550 | .398 |
| 6-16-69 | 425 | 18418026 | .596 | .448 |
| 6-30-69 | 439 | 20570662 | .616 | .500 |
| 8-19-69 | 489 | 22944734 | .686 | .558 |
| 9-24-69 | 525 | 25427148 | .736 | .618 |
| 10-23-69 | 554 | 27947020 | .777 | .679 |
| 11-18-69 | 580 | 30574057 | .813 | .743 |
| 12-31-69 | 623 | 32840841 | .874 | .798 |
| 1-15-70 | 638 | 35220263 | .895 | .856 |
| 1-31-70 | 654 | 38174791 | .917 | .928 |
| 2-15-70 | 669 | 40880717 | .938 | .994 |
| 3-31-70 | 713 | 41138610 | 1.000 | 1.000 |

FORM 6

Y AXIS (COST COMPLETION)

Sample #3 Contract: DAAF03-68-C-0048
 Regression Form: $\sqrt{Y} = A + BX$
 $A = .08172$ $B = .96591$
 Coefficient of Determination: .99033
 Coefficient of Variation: .04996

1.860 +

1.674 +

1.488 +

1.302 +

1.116 +

.930 +

.744 +

.558 +

.372 +

.186 +

.150

.300

.450

.600

.750

.900

1.050

1.200

X AXIS (TIME COMPLETION)

SAMPLE: #4

CONTRACTOR: Maremont Corp

CONTRACT NO: DAAA09-76-C-2003

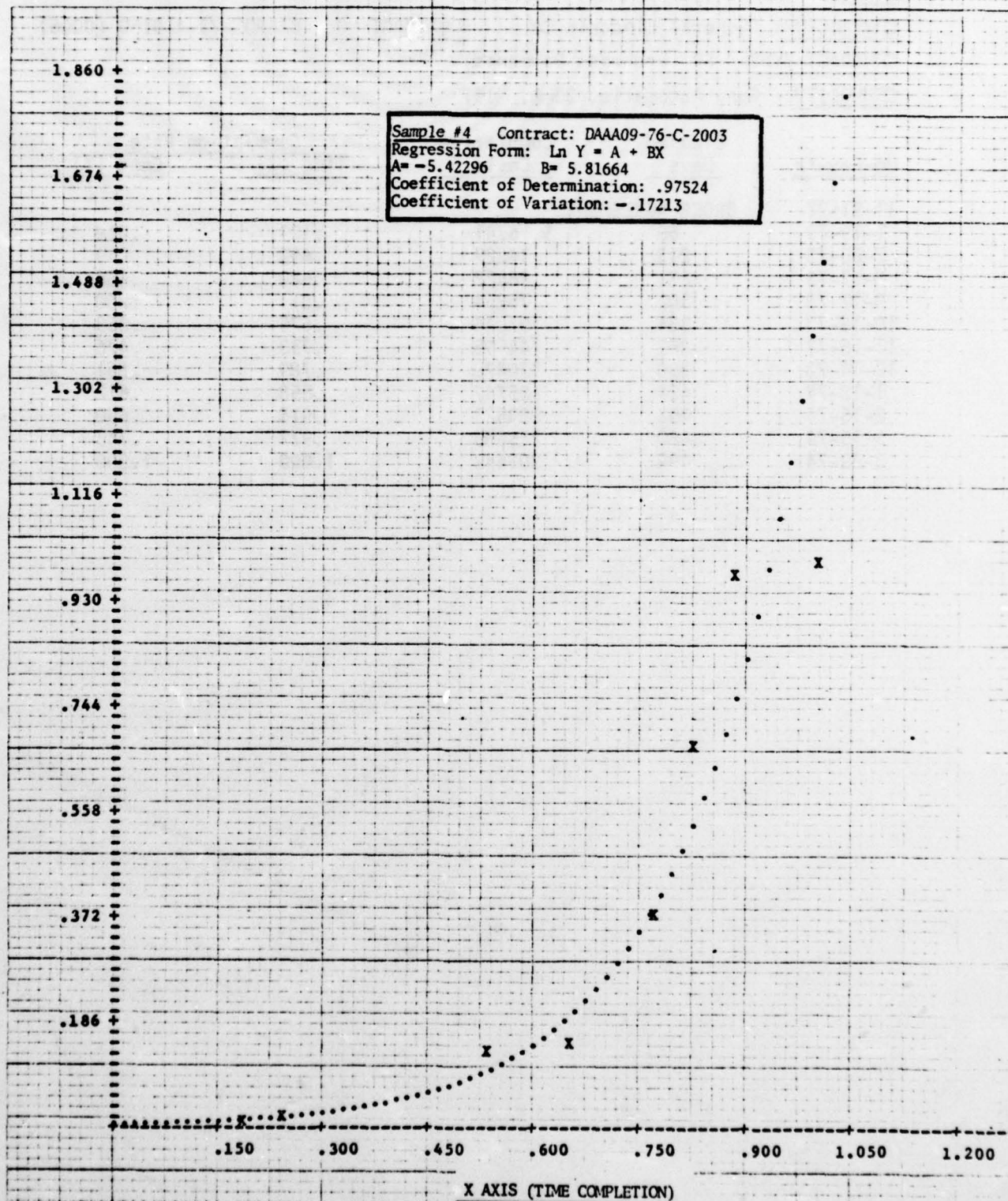
CONTRACT TYPE: FP

COMMODITY: Machine Gun, 7.62mm, Fixed, M60E2 w/BILI, Spare Parts & Support

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 7-30-75 | AWARD | | | |
| 9-15-75 | 48 | \$ 11200 | .184 | .010 |
| 9-30-75 | 63 | 22200 | .241 | .020 |
| 12-15-75 | 139 | 147087 | .533 | .134 |
| 1-15-76 | 170 | 163835 | .651 | .150 |
| 2-15-76 | 201 | 413609 | .770 | .378 |
| 2-29-76 | 215 | 740813 | .824 | .676 |
| 3-15-76 | 230 | 1070515 | .881 | .977 |
| 4-15-76 | 261 | 1095344 | 1.000 | 1.000 |

FORM 3

Y AXIS (COST COMPLETION)



X AXIS (TIME COMPLETION)

SAMPLE: #5

CONTRACTOR: General Electric Co.

CONTRACT NO: DAAF03-73-A-0150 (0006)

CONTRACT TYPE: FP (Progress Payments)

COMMODITY: Gun, Automatic, 20mm, M197

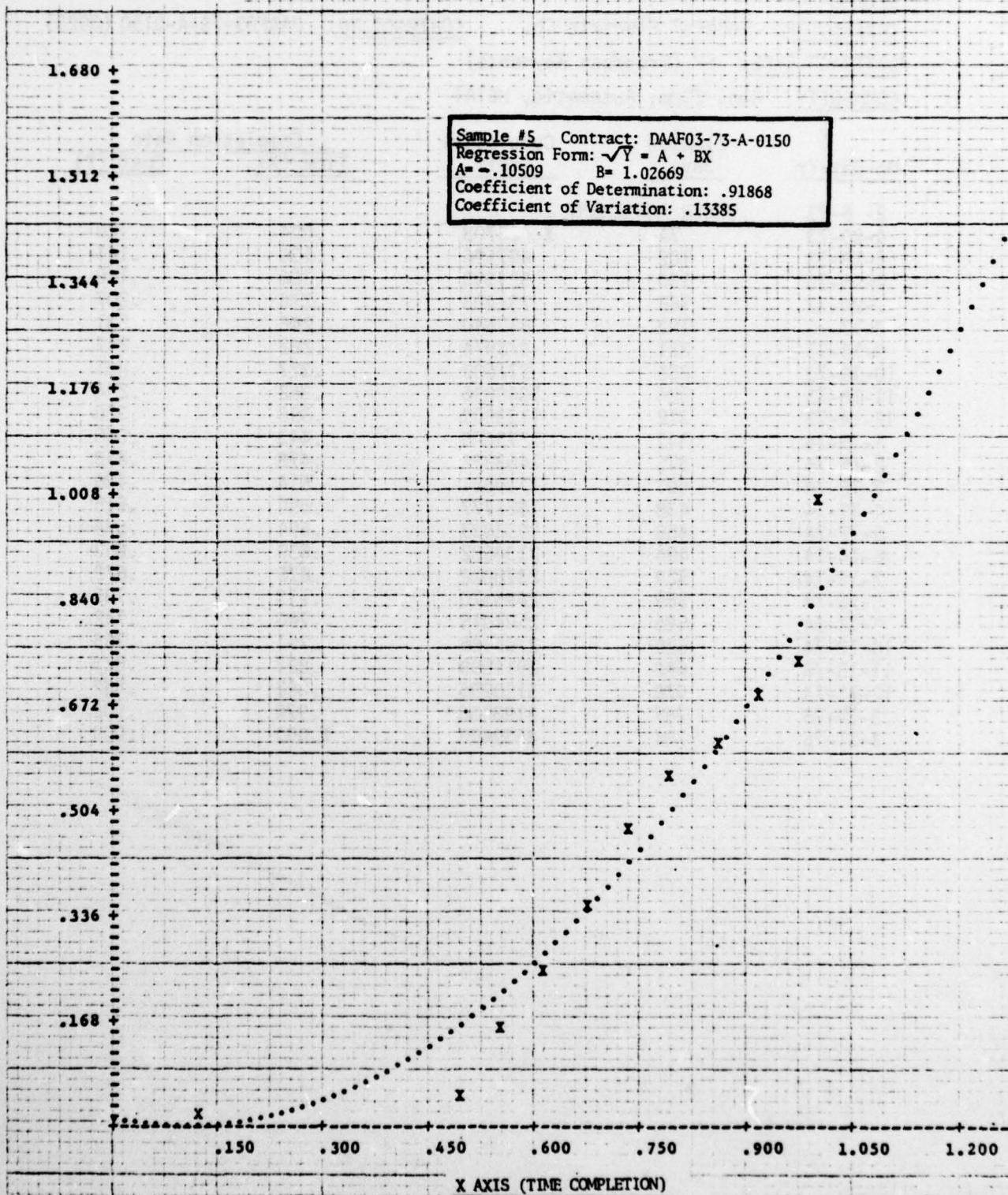
| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 11-21-72 | ORDER AGREEMENT | | | |
| 1-19-73 | 60 | \$ 5741 | .121 | .019 |
| 7-20-73 | 243 | 14827 | .492 | .049 |
| 8-17-73 | 271 | 48322 | .549 | .159 |
| 9-17-73 | 302 | 75854 | .611 | .250 |
| 10-19-73 | 334 | 107046 | .676 | .353 |
| 11-16-73 | 362 | 144565 | .733 | .476 |
| 12-14-73 | 390 | 170470 | .789 | .561 |
| 1-18-74 | 424 | 185747 | .858 | .612 |
| 2-15-74 | 452 | 209523 | .915 | .690 |
| 3-15-74 | 480 | 225686 | .972 | .743 |
| 3-29-74 | 494 | 303642 | 1.000 | 1.000 |

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FORM 6

Y AXIS (COST COMPLETION)



SAMPLE: #6

CONTRACTOR: General Electric Co.

CONTRACT NO: DAAF03-73-A-0150 (0023)

CONTRACT TYPE: FP (Progress Payments)

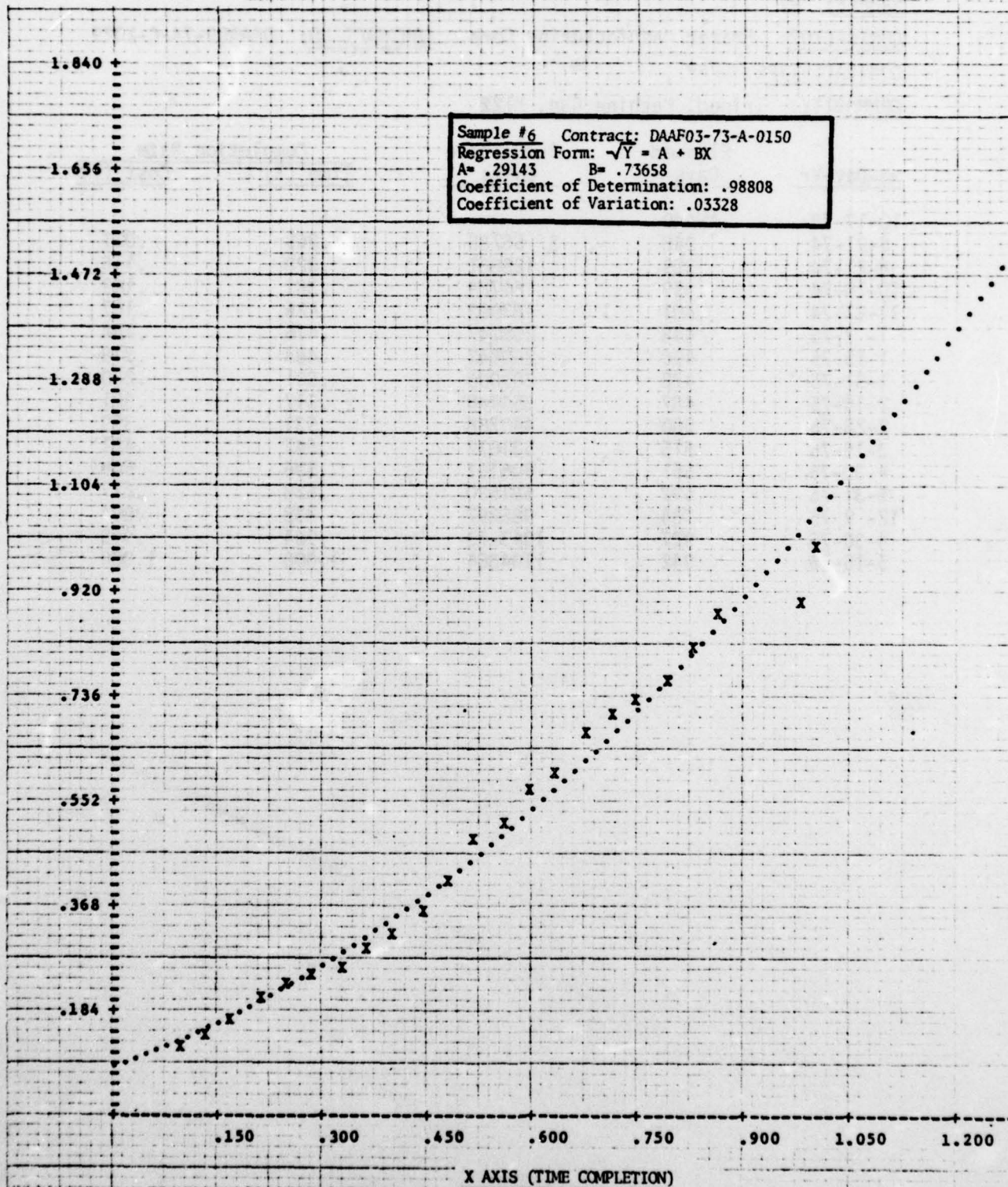
COMMODITY: Gun, 20mm, Automatic, M61A1

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 2- 6-73 | ORDER AGREEMENT | | | |
| 4-20-73 | 74 | \$ 425703 | .094 | .120 |
| 5-18-73 | 102 | 497596 | .130 | .141 |
| 6-15-73 | 130 | 594390 | .166 | .168 |
| 7-20-73 | 165 | 731483 | .210 | .207 |
| 8-17-73 | 193 | 817640 | .246 | .231 |
| 9-14-73 | 221 | 873974 | .282 | .247 |
| 10-19-73 | 256 | 922603 | .327 | .261 |
| 11-16-73 | 284 | 1040096 | .362 | .294 |
| 12-14-73 | 312 | 1133909 | .398 | .320 |
| 1-18-74 | 347 | 1273686 | .443 | .360 |
| 2-15-74 | 375 | 1463332 | .478 | .413 |
| 3-15-74 | 403 | 1719621 | .514 | .486 |
| 4-19-74 | 438 | 1821777 | .559 | .515 |
| 5-17-74 | 466 | 2032893 | .594 | .574 |
| 6-14-74 | 494 | 2134582 | .630 | .603 |
| 7-19-74 | 529 | 2378870 | .675 | .672 |
| 8-16-74 | 559 | 2495370 | .713 | .705 |
| 9-13-74 | 585 | 2591015 | .746 | .732 |
| 10-18-74 | 620 | 2707486 | .791 | .765 |
| 11-15-74 | 648 | 2911599 | .827 | .823 |
| 12-13-74 | 676 | 3120235 | .862 | .882 |
| 3-14-75 | 767 | 3193136 | .978 | .902 |
| 3-31-75 | 784 | 3539498 | 1.000 | 1.000 |

FORM 6

Y AXIS (COST COMPLETION)

Sample #6 Contract: DAAF03-73-A-0150
 Regression Form: $\sqrt{Y} = A + BX$
 A = .29143 B = .73658
 Coefficient of Determination: .98808
 Coefficient of Variation: .03328



SAMPLE: #7

CONTRACTOR: Frazer Manufacturing Corp. CONTRACT NO: DAAA09-74-C-2029

CONTRACT TYPE: FFP

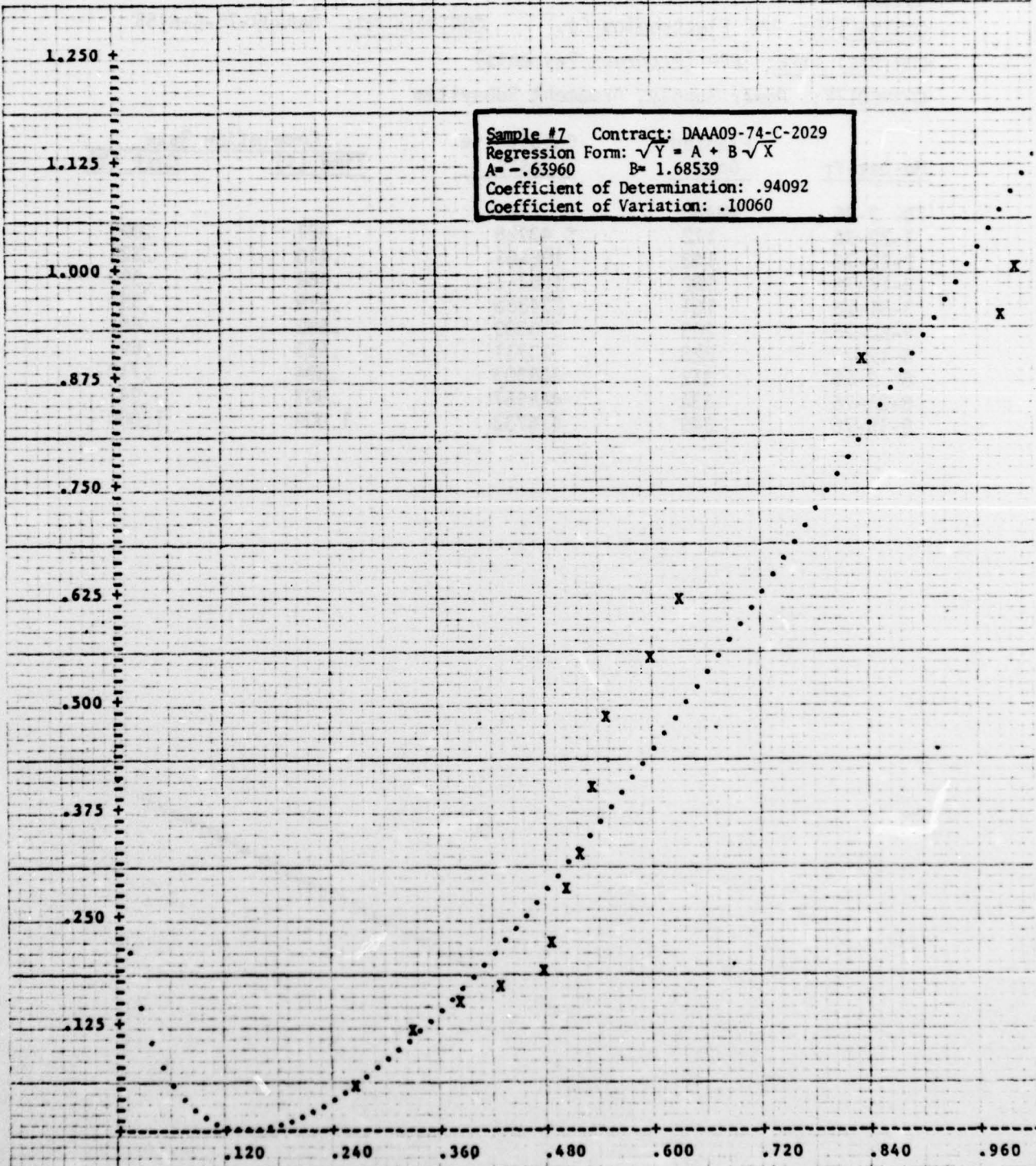
COMMODITY: Tripod, Machine Gun, M122

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 10-17-73 | AWARD | | | |
| 6-21-74 | 248 | \$ 56785 | .263 | .051 |
| 8-21-74 | 309 | 128001 | .328 | .116 |
| 10-10-74 | 359 | 164729 | .381 | .149 |
| 11-21-74 | 401 | 183992 | .426 | .167 |
| 1- 7-75 | 448 | 203747 | .476 | .184 |
| 1-15-75 | 456 | 240843 | .484 | .218 |
| 1-31-75 | 472 | 309006 | .501 | .280 |
| 2-15-75 | 487 | 354448 | .517 | .321 |
| 2-28-75 | 500 | 440788 | .531 | .399 |
| 3-15-75 | 515 | 531672 | .547 | .481 |
| 4-30-75 | 561 | 606197 | .596 | .549 |
| 5-31-75 | 592 | 681630 | .628 | .617 |
| 12- 9-75 | 784 | 986897 | .832 | .894 |
| 4-30-76 | 927 | 1043973 | .984 | .945 |
| 5-15-76 | 942 | 1104364 | 1.000 | 1.000 |

FORM 8

Y AXIS (COST COMPLETION)

Sample #7 Contract: DAAA09-74-C-2029
 Regression Form: $\sqrt{Y} = A + B\sqrt{X}$
 A = -.63960 B = 1.68539
 Coefficient of Determination: .94092
 Coefficient of Variation: .10060



X AXIS (TIME COMPLETION)

SAMPLE: #8

CONTRACTOR: UMC Electronics Co.

CONTRACT NO: DAAA09-76-C-6155

CONTRACT TYPE: FFP (Progress Payments)

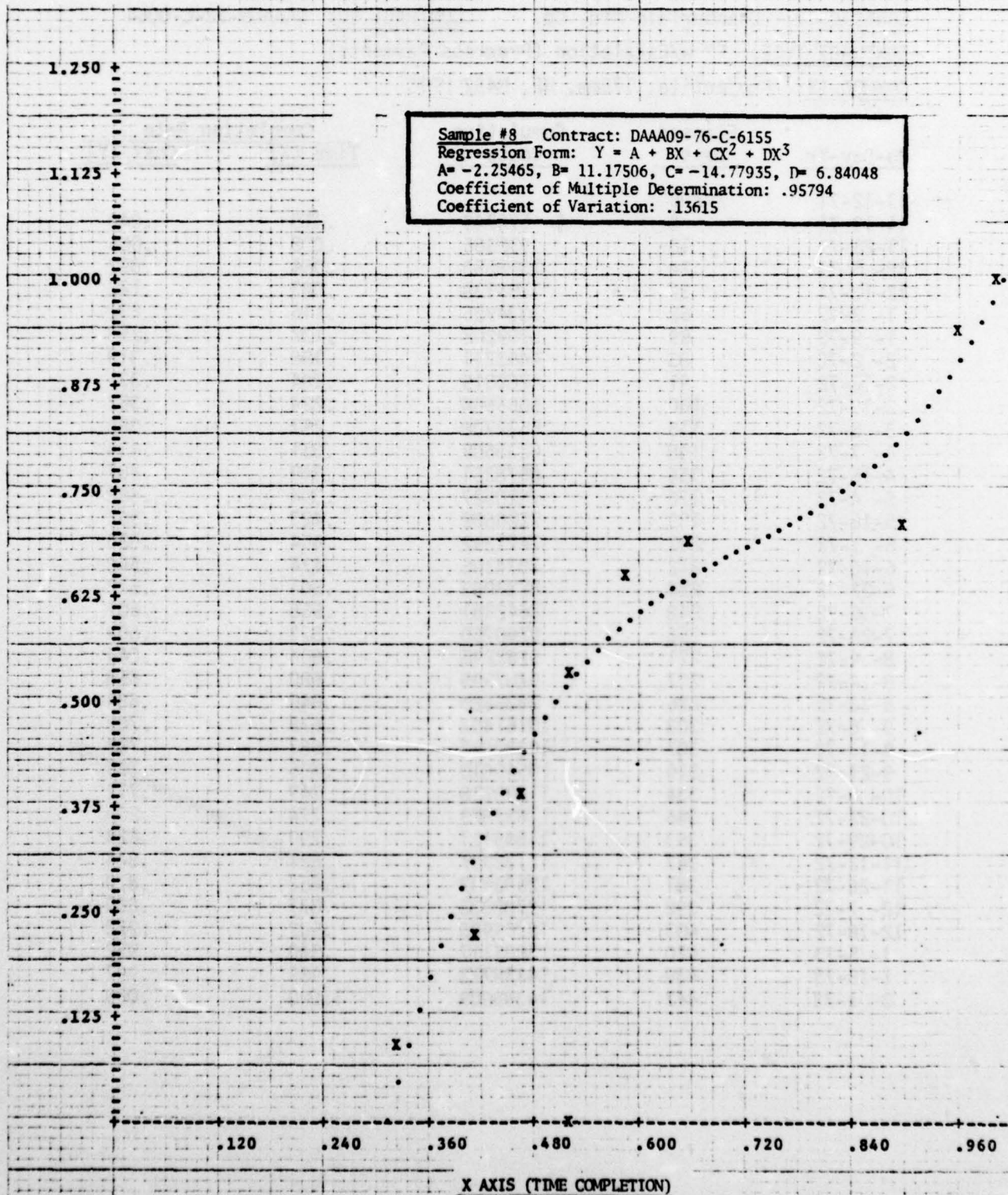
COMMODITY: Power Supply, Armament Subsystem

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 10- 3-75 | AWARD | | | |
| 1-22-76 | 112 | \$ 43726 | .321 | .092 |
| 2-22-76 | 143 | 106103 | .410 | .223 |
| 3-12-76 | 162 | 185747 | .464 | .390 |
| 3-31-76 | 181 | 254338 | .519 | .534 |
| 4-22-76 | 203 | 310503 | .582 | .651 |
| 5-17-76 | 228 | 329731 | .653 | .691 |
| 8- 9-76 | 312 | 338303 | .894 | .710 |
| 8-31-76 | 334 | 448557 | .957 | .941 |
| 9-15-76 | 349 | 476732 | 1.000 | 1.000 |

FORM 12

Y AXIS (COST COMPLETION)

Sample #8 Contract: DAAA09-76-C-6155
 Regression Form: $Y = A + BX + CX^2 + DX^3$
 $A = -2.25465$, $B = 11.17506$, $C = -14.77935$, $D = 6.84048$
 Coefficient of Multiple Determination: .95794
 Coefficient of Variation: .13615



SAMPLE: #9

CONTRACTOR: Chamberlain Mfg. Co.

CONTRACT NO: DAAA09-72-C-0064

CONTRACT TYPE: FP w/Escalation (Progress Payments)

COMMODITY: Projectile, 175mm, HE, M437 MPTS

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 11-12-71 | AWARD | | | |
| 11-19-71 | 8 | \$ 576749 | .018 | .040 |
| 11-21-71 | 10 | 938365 | .022 | .065 |
| 12- 5-71 | 24 | 1328853 | .054 | .092 |
| 12-18-71 | 37 | 1754139 | .083 | .122 |
| 1- 2-72 | 52 | 3334926 | .116 | .232 |
| 1- 9-72 | 59 | 3709202 | .132 | .258 |
| 2- 2-72 | 83 | 4463711 | .186 | .310 |
| 2-10-72 | 91 | 4762019 | .204 | .331 |
| 2-19-72 | 100 | 5065504 | .224 | .352 |
| 3- 5-72 | 115 | 5532708 | .257 | .385 |
| 4- 7-72 | 148 | 6235609 | .331 | .434 |
| 4-15-72 | 156 | 6578251 | .349 | .457 |
| 5- 4-72 | 176 | 7020627 | .394 | .488 |
| 5-18-72 | 189 | 7220682 | .423 | .502 |
| 6- 1-72 | 203 | 7471392 | .454 | .520 |
| 6-10-72 | 212 | 7874305 | .474 | .548 |
| 6-22-72 | 224 | 8223063 | .501 | .572 |
| 7-16-72 | 248 | 8642381 | .555 | .601 |
| 7-24-72 | 256 | 8760760 | .573 | .609 |
| 8- 4-72 | 271 | 9262295 | .606 | .644 |
| 8-14-72 | 277 | 9457995 | .620 | .658 |
| 8-23-72 | 286 | 9835525 | .640 | .684 |
| 9- 6-72 | 303 | 10161403 | .678 | .707 |
| 9-13-72 | 307 | 10380442 | .687 | .722 |
| 9-21-72 | 315 | 10545810 | .705 | .733 |
| 10- 8-72 | 334 | 11095818 | .747 | .772 |
| 10-22-72 | 346 | 11637873 | .774 | .809 |
| 10-29-72 | 353 | 11843121 | .790 | .824 |
| 11-12-72 | 367 | 12132907 | .821 | .844 |
| 11-26-72 | 381 | 12503992 | .852 | .870 |
| 12- 7-72 | 392 | 12782333 | .877 | .889 |
| 12-18-72 | 403 | 13269995 | .902 | .923 |
| 1- 5-73 | 420 | 13687117 | .940 | .952 |
| 1-15-73 | 430 | 14338713 | .962 | .997 |
| 2- 1-73 | 447 | 14380009 | 1.000 | 1.000 |

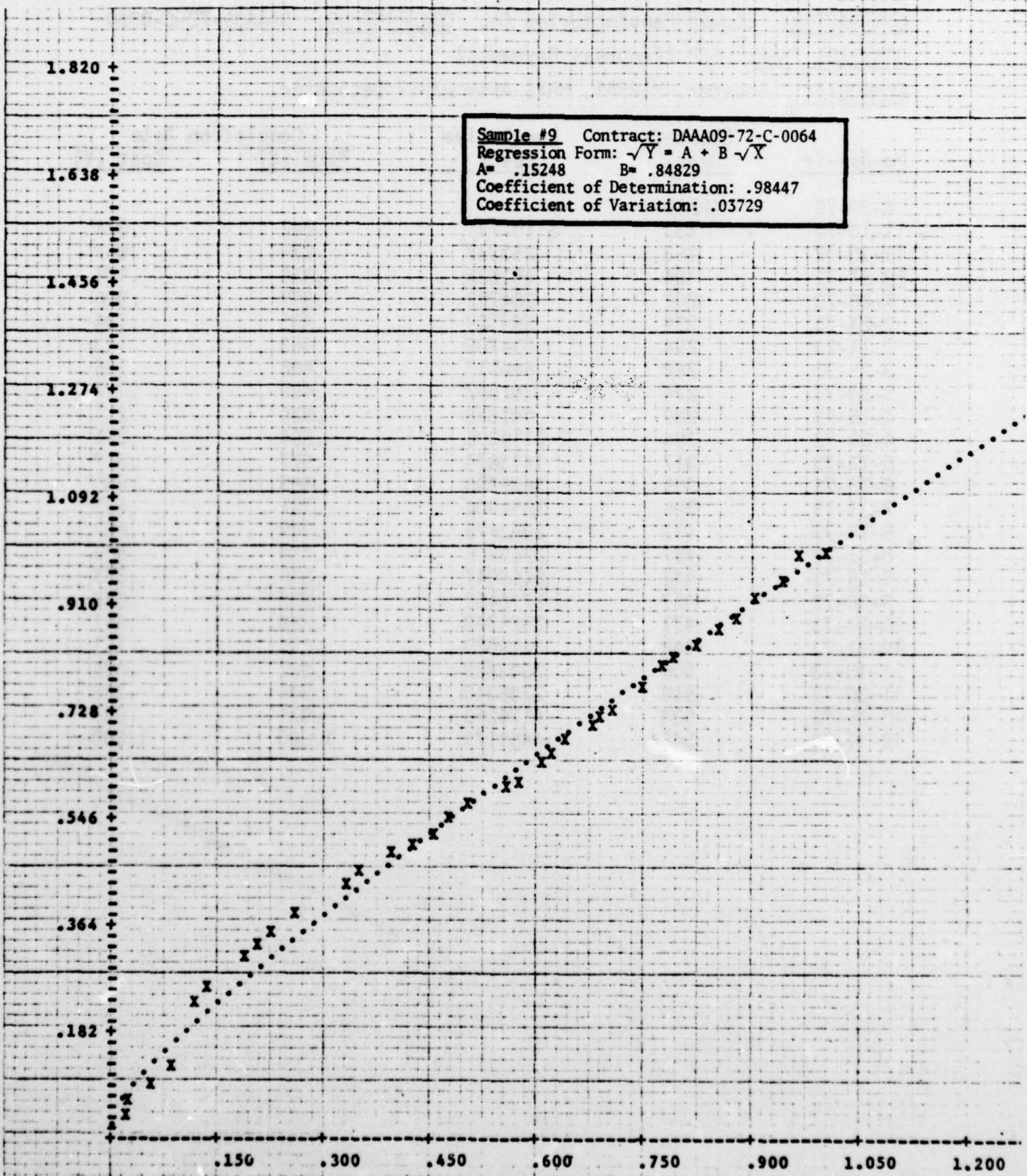
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WANG LABORATORIES, INC. 615 0004

FORM 8

Y AXIS (COST COMPLETION)

Sample #9 Contract: DAAA09-72-C-0064
Regression Form: $\sqrt{Y} = A + B\sqrt{X}$
A = .15248 B = .84829
Coefficient of Determination: .98447
Coefficient of Variation: .03729



X AXIS (TIME COMPLETION)

SAMPLE: #10

CONTRACTOR: Etowah Manufacturing Co. CONTRACT NO: DAAA09-72-C-0360

CONTRACT TYPE: FSP (Progress Payments)

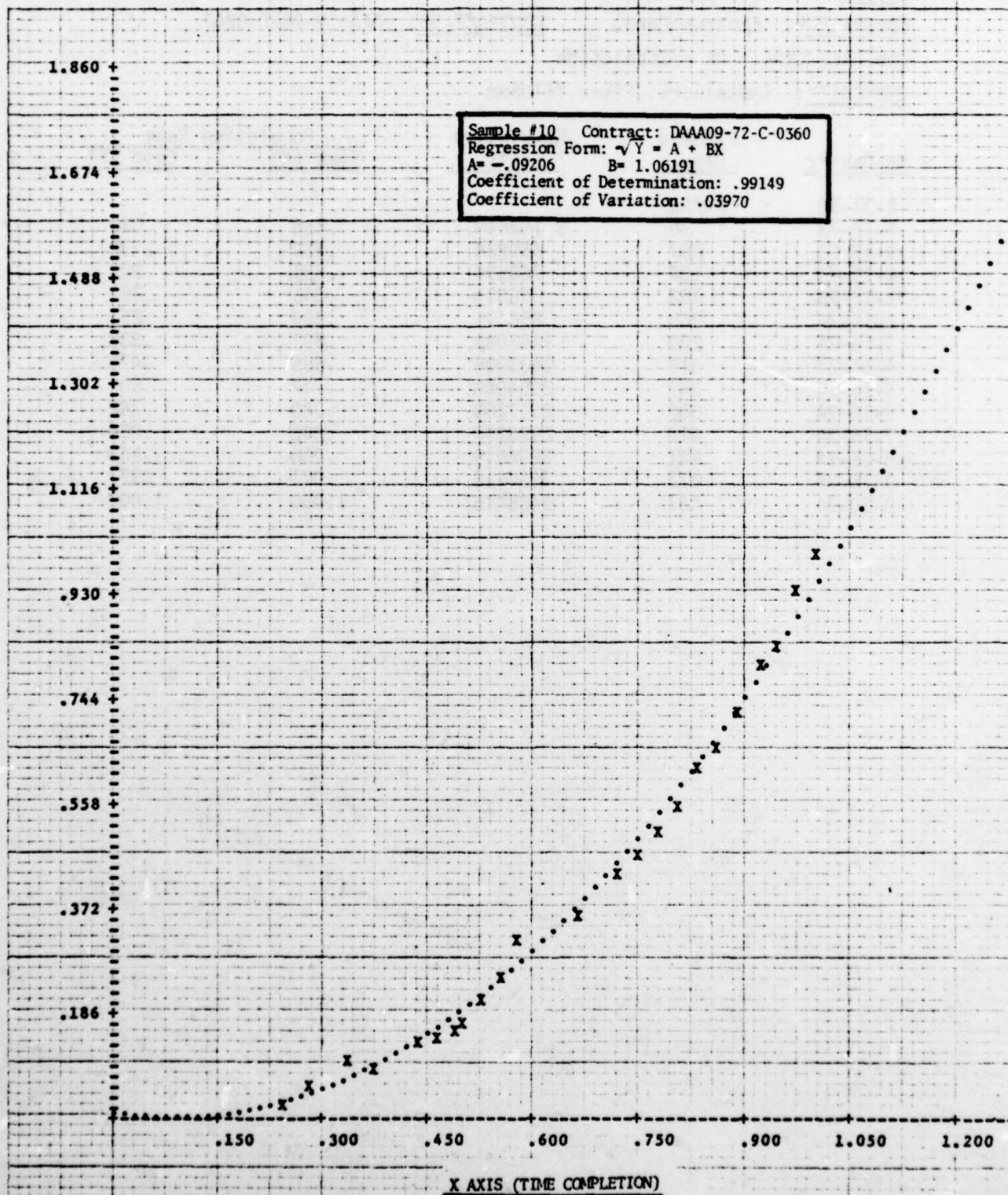
COMMODITY: Booster, M125A1, MPTS Assy w/M17 Detonator

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 6-30-72 | AWARD | | | |
| 11-10-72 | 133 | \$ 107731 | .242 | .024 |
| 11-30-72 | 153 | 253337 | .279 | .057 |
| 12-31-72 | 184 | 451223 | .335 | .101 |
| 1-20-73 | 204 | 384792 | .372 | .086 |
| 2-24-73 | 239 | 599359 | .435 | .134 |
| 3-11-73 | 254 | 636709 | .463 | .143 |
| 3-25-73 | 268 | 696117 | .488 | .156 |
| 3-31-73 | 274 | 762547 | .499 | .171 |
| 4-15-73 | 289 | 941868 | .526 | .211 |
| 4-30-73 | 304 | 1119305 | .554 | .251 |
| 5-13-73 | 317 | 1413874 | .577 | .317 |
| 6-30-73 | 365 | 1605250 | .665 | .360 |
| 7-31-73 | 396 | 1939904 | .721 | .435 |
| 8-15-73 | 411 | 2082476 | .749 | .467 |
| 8-31-73 | 427 | 2269805 | .778 | .509 |
| 9-15-73 | 442 | 2466047 | .805 | .553 |
| 9-30-73 | 457 | 2775462 | .832 | .622 |
| 10-14-73 | 471 | 2929748 | .858 | .657 |
| 10-31-73 | 488 | 3214029 | .889 | .721 |
| 11-18-73 | 506 | 3583823 | .922 | .804 |
| 11-30-73 | 518 | 3736313 | .944 | .838 |
| 12-15-73 | 533 | 4176263 | .971 | .937 |
| 12-31-73 | 549 | 4459171 | 1.000 | 1.000 |

FORM 6

Y AXIS (COST COMPLETION)

Sample #10 Contract: DAAA09-72-C-0360
 Regression Form: $\sqrt{Y} = A + BX$
 $A = -.09206$ $B = 1.06191$
 Coefficient of Determination: .99149
 Coefficient of Variation: .03970



SAMPLE: #11

CONTRACTOR: Centron Corp.

CONTRACT NO: DAAA09-73-C-0267

CONTRACT TYPE: FP w/Escalation

COMMODITY: Containers, Fiber f/105mm

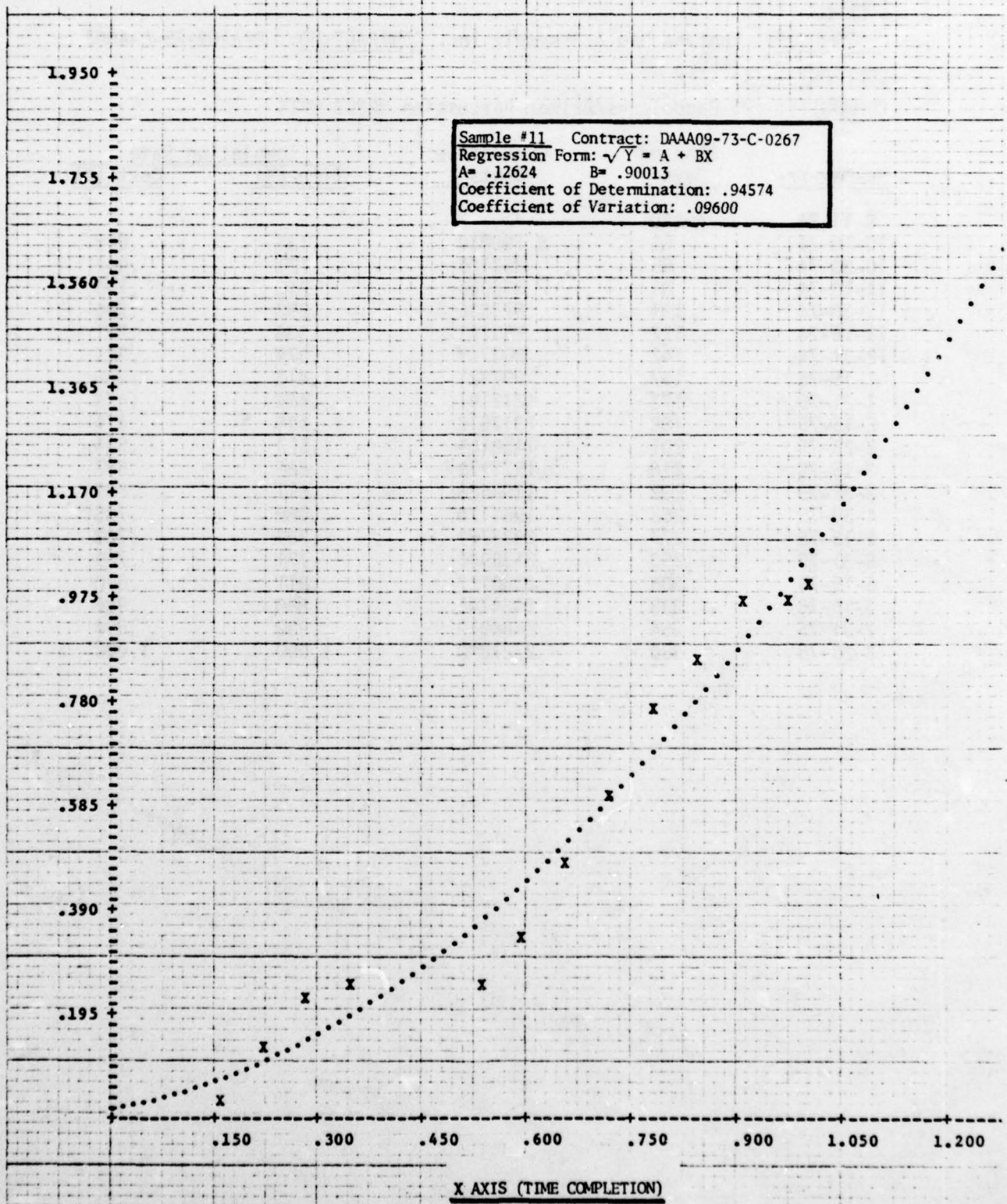
| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 5-31-73 | AWARD | | | |
| 8-15-73 | 76 | \$ 107619 | .156 | .032 |
| 9-15-73 | 107 | 450828 | .220 | .132 |
| 10-15-73 | 137 | 768594 | .281 | .225 |
| 11-15-73 | 168 | 855911 | .345 | .251 |
| 2-15-74 | 260 | 856391 | .534 | .251 |
| 3-15-74 | 288 | 1151043 | .591 | .338 |
| 4-15-74 | 319 | 1633006 | .655 | .479 |
| 5-15-74 | 349 | 2054088 | .717 | .603 |
| 6-15-74 | 380 | 2617283 | .780 | .768 |
| 7-15-74 | 410 | 2923298 | .842 | .858 |
| 8-15-74 | 441 | 3298019 | .906 | .968 |
| 9-16-74 | 473 | 3310418 | .971 | .971 |
| 9-30-74 | 487 | 3408416 | 1.000 | 1.000 |

WANG LABORATORIES, INC. 415 0204

WANG LABORATORIES, INC. 415 0204

FORM 6

Y AXIS (COST COMPLETION)



SAMPLE: #12

CONTRACTOR: Montana Mfg & Assembly Inc. CONTRACT NO: DAAA09-75-C-4002

CONTRACT TYPE: FFP

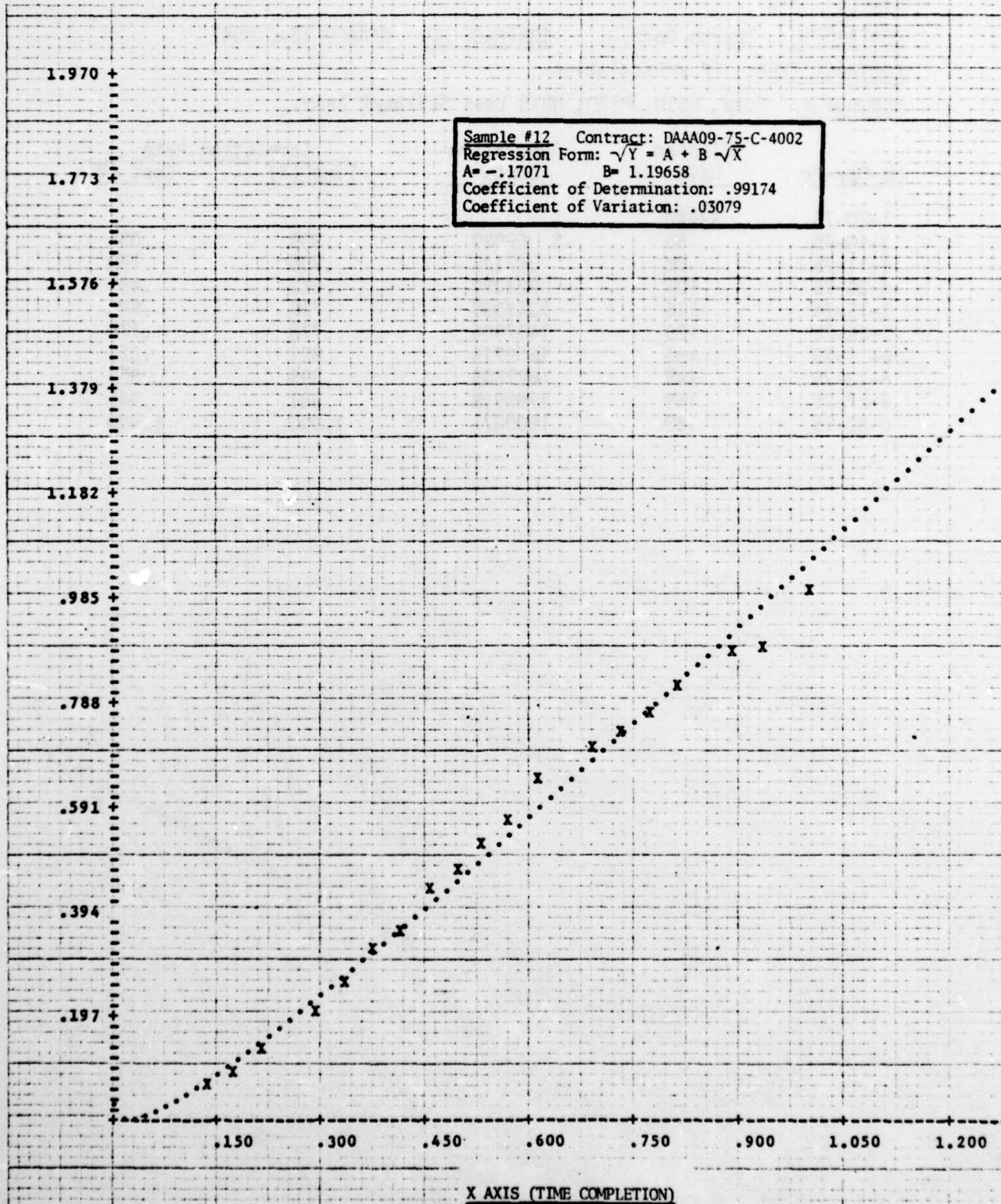
COMMODITY: M3 Bandoleers/Primer Percussion M28B2 MPTS

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 8-11-74 | AWARD | | | |
| 10-18-74 | 51 | \$ 188830 | .134 | .068 |
| 10-30-74 | 65 | 257129 | .171 | .092 |
| 11-14-74 | 81 | 376069 | .213 | .135 |
| 11-30-74 | 111 | 573836 | .292 | .206 |
| 12-16-74 | 127 | 725271 | .334 | .261 |
| 12-31-74 | 142 | 903749 | .374 | .325 |
| 1-15-75 | 157 | 997221 | .413 | .358 |
| 1-31-75 | 173 | 1217191 | .455 | .438 |
| 2-15-75 | 188 | 1317512 | .495 | .474 |
| 2-28-75 | 201 | 1458109 | .529 | .524 |
| 3-15-75 | 216 | 1577773 | .568 | .567 |
| 3-31-75 | 232 | 1794528 | .611 | .645 |
| 4-30-75 | 262 | 1961170 | .689 | .705 |
| 5-15-75 | 277 | 2037779 | .729 | .733 |
| 5-31-75 | 293 | 2138946 | .771 | .769 |
| 6-15-75 | 308 | 2280187 | .811 | .820 |
| 7-15-75 | 338 | 2464742 | .889 | .886 |
| 7-31-75 | 354 | 2488019 | .932 | .894 |
| 8-26-75 | 380 | 2781800 | 1.000 | 1.000 |

FORM 8

Y AXIS (COST COMPLETION)

Sample #12 Contract: DAAA09-75-C-4002
Regression Form: $\sqrt{Y} = A + B \sqrt{X}$
A = -.17071 B = 1.19658
Coefficient of Determination: .99174
Coefficient of Variation: .03079



SAMPLE: #13

CONTRACTOR: Dayron Corp.

CONTRACT NO: DAAA09-75-C-0047

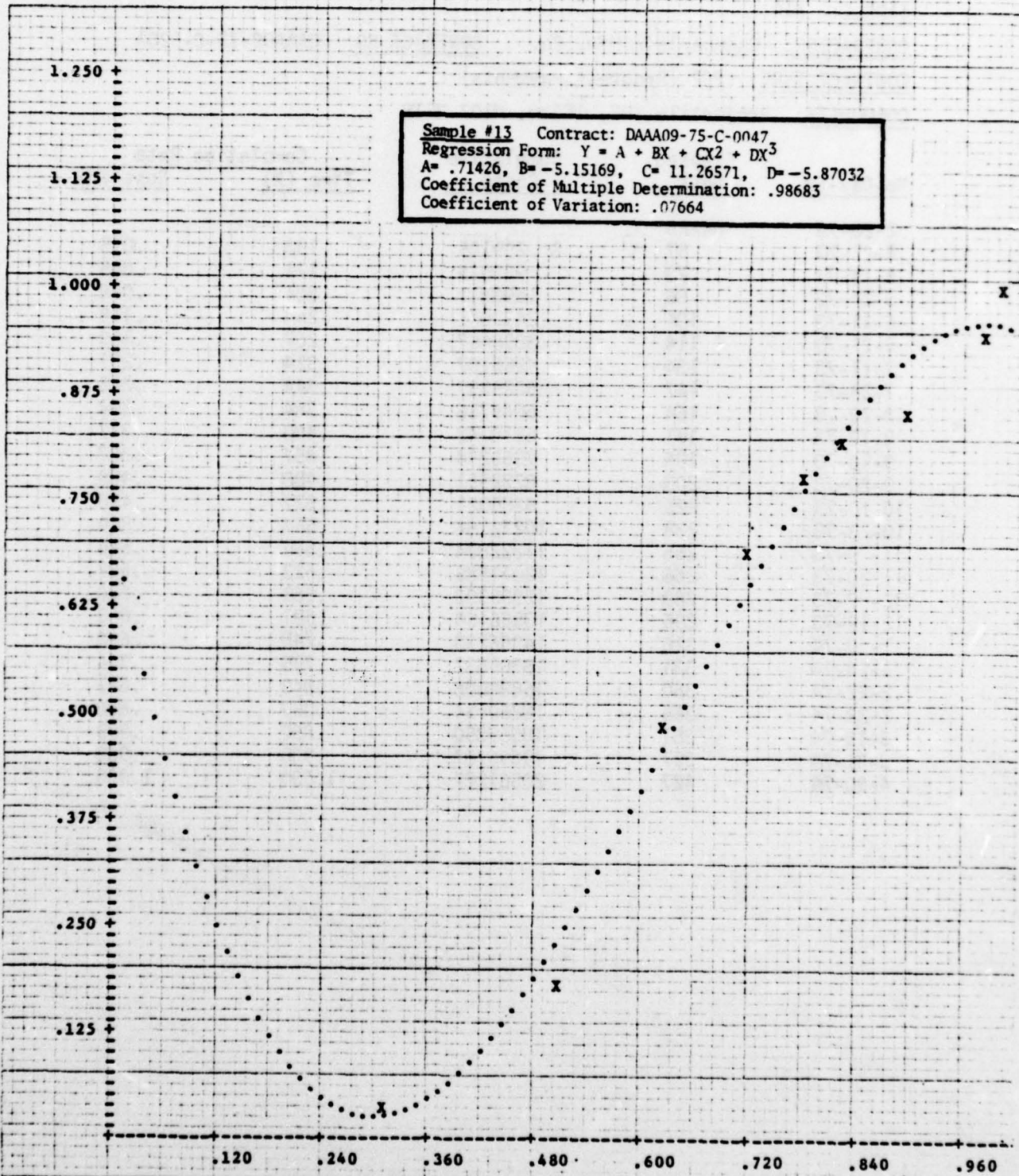
CONTRACT TYPE: FP w/Escalation

COMMODITY: Fuze, M550, PIBD, MPTS Less Spitback Assy.

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 1-20-75 | AWARD | | | |
| 3-10-75 | 50 | \$ 69020 | .309 | .036 |
| 4-11-75 | 82 | 342183 | .506 | .180 |
| 4-30-75 | 101 | 921387 | .623 | .485 |
| 5-15-75 | 116 | 1311398 | .716 | .690 |
| 5-25-75 | 126 | 1477966 | .778 | .778 |
| 6- 1-75 | 133 | 1559714 | .821 | .821 |
| 6-13-75 | 145 | 1621845 | .895 | .853 |
| 6-27-75 | 159 | 1795938 | .981 | .945 |
| 6-30-75 | 162 | 1900871 | 1.000 | 1.000 |

FORM 12

Y AXIS (COST COMPLETION)



X AXIS (TIME COMPLETION)

SAMPLE: #14

CONTRACTOR: Chamberlain Mfg. Co. CONTRACT NO: DAAA09-73-C-0201

CONTRACT TYPE: FFP (Progress Payments)

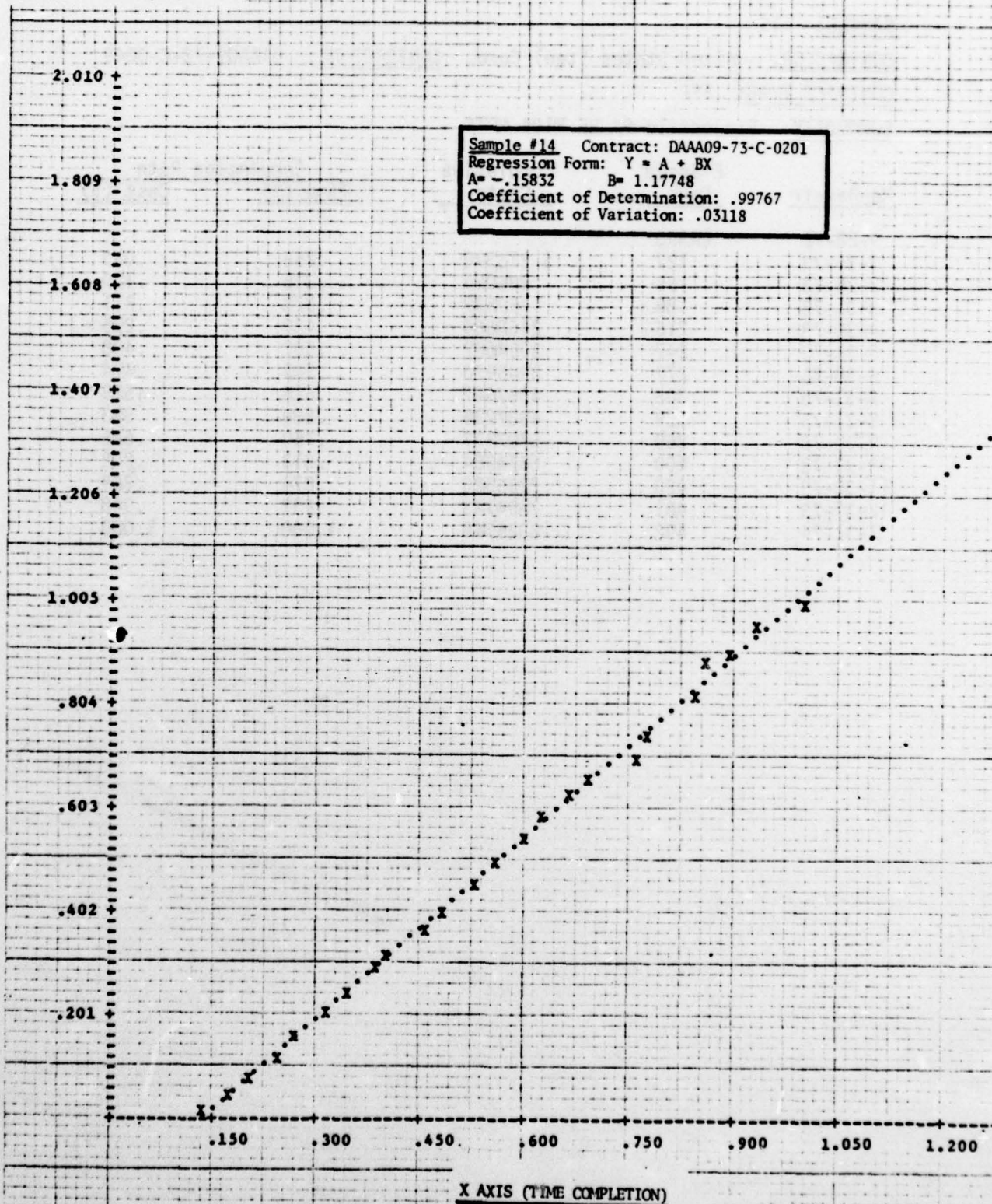
COMMODITY: Projectile, HE, 155mm, M107 MPTS

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 2-28-73 | AWARD | | | |
| 4-25-73 | 57 | \$ 299105 | .133 | .015 |
| 5-11-73 | 73 | 929039 | .171 | .045 |
| 5-24-73 | 86 | 1593811 | .201 | .078 |
| 6-11-73 | 104 | 2430041 | .244 | .118 |
| 6-21-73 | 114 | 3298487 | .267 | .160 |
| 7-11-73 | 134 | 4255107 | .314 | .207 |
| 7-24-73 | 147 | 5029337 | .344 | .245 |
| 8-10-73 | 164 | 6049736 | .384 | .294 |
| 8-17-73 | 171 | 6510742 | .400 | .317 |
| 9-10-73 | 195 | 7555234 | .457 | .367 |
| 9-20-73 | 205 | 8222951 | .480 | .400 |
| 10-10-73 | 225 | 9380021 | .527 | .456 |
| 10-23-73 | 238 | 10272184 | .557 | .500 |
| 11- 9-73 | 255 | 11222874 | .597 | .546 |
| 11-20-73 | 266 | 12071685 | .623 | .587 |
| 12- 7-73 | 283 | 12933393 | .663 | .630 |
| 12-19-73 | 295 | 13566460 | .691 | .660 |
| 1- 9-74 | 316 | 14356230 | .740 | .698 |
| 1-24-74 | 331 | 15306637 | .775 | .744 |
| 2-22-74 | 360 | 16888008 | .843 | .821 |
| 2-28-74 | 366 | 18260154 | .857 | .888 |
| 3-15-74 | 381 | 18559850 | .892 | .903 |
| 3-31-74 | 397 | 19696787 | .930 | .958 |
| 4-30-74 | 427 | 20561227 | 1.000 | 1.000 |

FORM 1

Y AXIS (COST COMPLETION)

Sample #14 Contract: DAAA09-73-C-0201
Regression Form: $Y = A + BX$
 $A = -.15832$ $B = 1.17748$
Coefficient of Determination: .99767
Coefficient of Variation: .03118



SAMPLE: #15

CONTRACTOR: United States Steel Corp. CONTRACT NO: DAAA09-73-C-0048

CONTRACT TYPE: FFP

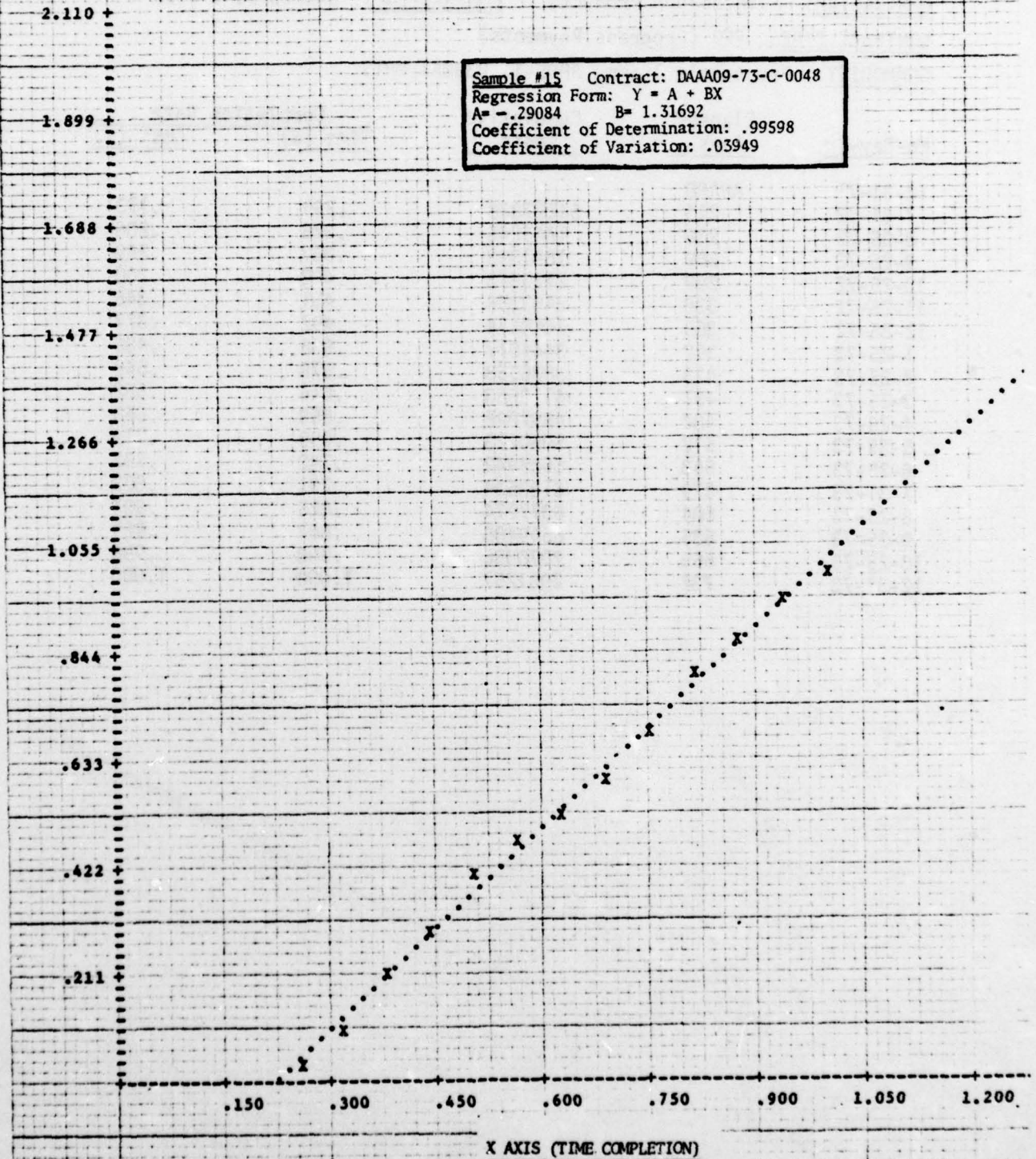
COMMODITY: Projectile 8" HE M106 MPTS

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 9-28-72 | AWARD | | | |
| 1-31-73 | 127 | \$ 276390 | .258 | .033 |
| 2-28-73 | 155 | 836056 | .315 | .100 |
| 3-31-73 | 186 | 1759635 | .378 | .211 |
| 4-30-73 | 216 | 2458884 | .439 | .295 |
| 5-31-73 | 247 | 3394602 | .502 | .408 |
| 6-30-73 | 277 | 3945970 | .563 | .474 |
| 7-31-73 | 308 | 4367047 | .626 | .525 |
| 8-31-73 | 339 | 4937226 | .689 | .593 |
| 9-30-73 | 369 | 5707937 | .750 | .686 |
| 10-31-73 | 400 | 6674964 | .813 | .802 |
| 11-30-73 | 430 | 7235526 | .874 | .869 |
| 12-31-73 | 461 | 7894743 | .937 | .948 |
| 1-31-74 | 492 | 8325748 | 1.000 | 1.000 |

FORM 1

Y AXIS (COST COMPLETION)

Sample #15 Contract: DAAA09-73-C-0048
Regression Form: $Y = A + BX$
 $A = -.29084$ $B = 1.31692$
Coefficient of Determination: .99598
Coefficient of Variation: .03949



SAMPLE: #16

CONTRACTOR: Flinchbaugh Products CONTRACT NO: DAAA09-72-C-0190

CONTRACT TYPE: FFP (Progress Payments)

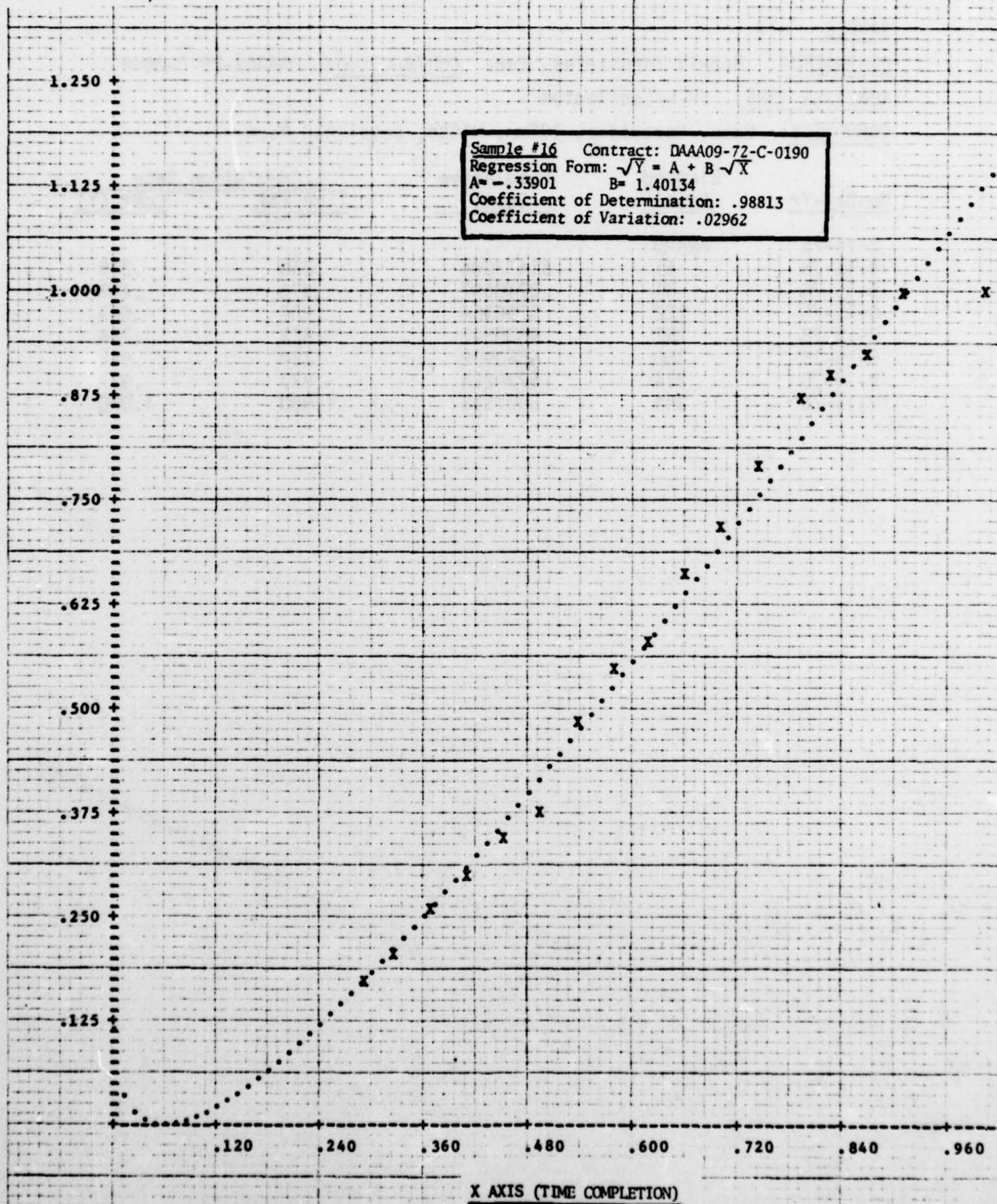
COMMODITY: Projectile 105mm, APDS-T, M392A1 MPTS

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 12-31-71 | AWARD | | | |
| 7-31-72 | 213 | \$1227838 | .291 | .173 |
| 8-25-72 | 238 | 1456245 | .325 | .206 |
| 9-25-72 | 269 | 1841398 | .367 | .260 |
| 10-25-72 | 299 | 2123828 | .408 | .300 |
| 11-25-72 | 330 | 2453354 | .451 | .346 |
| 12-25-72 | 360 | 2668274 | .492 | .377 |
| 1-25-73 | 392 | 3444012 | .536 | .486 |
| 2-25-73 | 423 | 3886358 | .578 | .549 |
| 3-25-73 | 451 | 4118683 | .616 | .582 |
| 4-25-73 | 482 | 4697096 | .658 | .663 |
| 5-25-73 | 512 | 5090223 | .699 | .719 |
| 6-25-73 | 543 | 5609942 | .742 | .792 |
| 7-31-73 | 579 | 6183534 | .791 | .873 |
| 8-25-73 | 604 | 6377274 | .825 | .901 |
| 9-25-73 | 635 | 6549488 | .867 | .925 |
| 10-25-73 | 665 | 7070556 | .908 | .998 |
| 12-31-73 | 732 | 7081257 | 1.000 | 1.000 |

FORM 8

Y AXIS (COST COMPLETION)

Sample #16 Contract: DAAA09-72-C-0190
Regression Form: $\sqrt{Y} = A + B\sqrt{X}$
A = -.33901 B = 1.40134
Coefficient of Determination: .98813
Coefficient of Variation: .02962



SAMPLE: #17

CONTRACTOR: Morris Industries, Inc. CONTRACT NO: DAAA09-75-C-0048

CONTRACT TYPE: FP w/Escalation

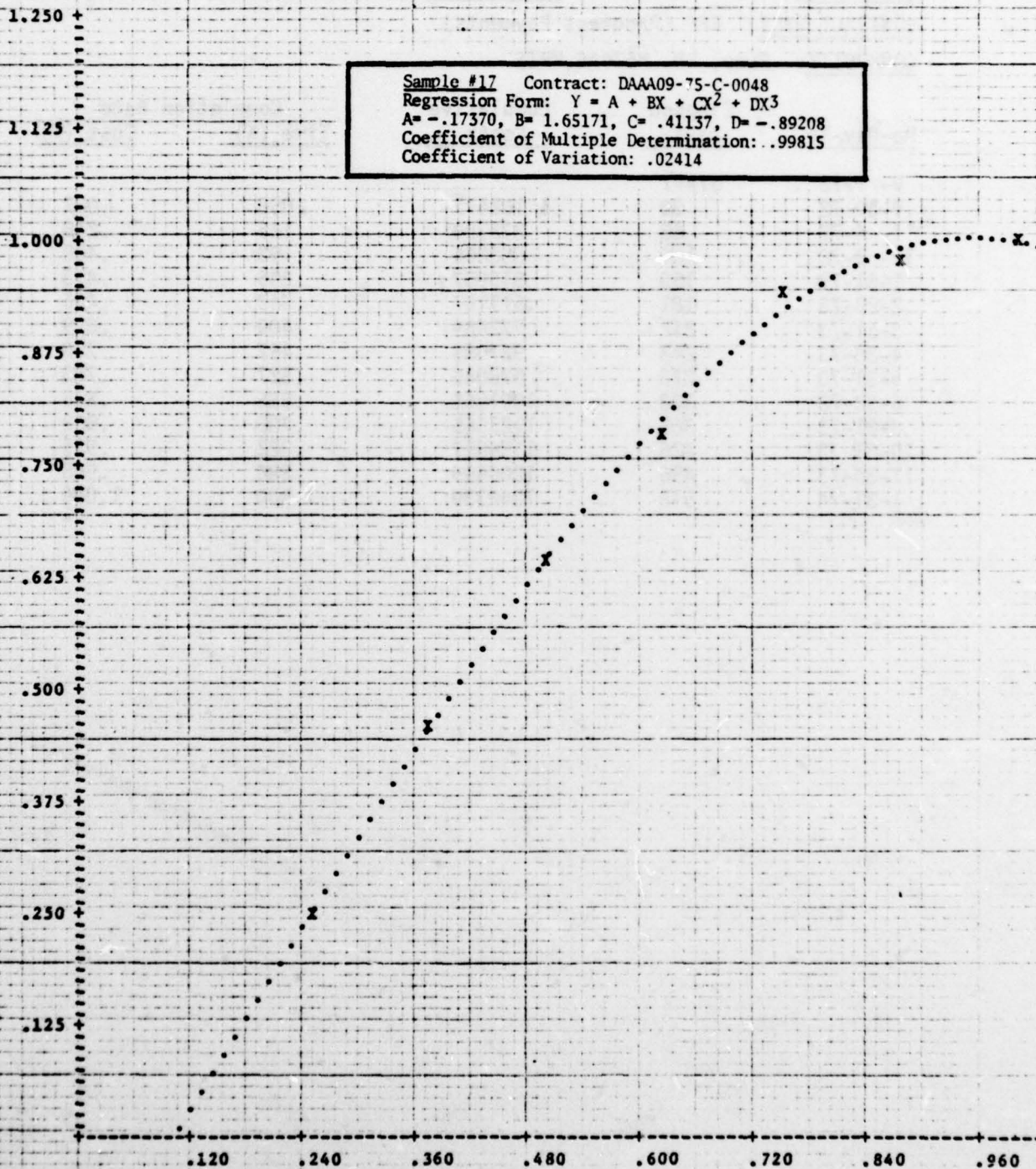
COMMODITY: Case, Cartridge, 105mm, M1484, Level A&C Pack

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 2-14-75 | AWARD | | | |
| 4-15-75 | 61 | \$1473084 | .250 | .249 |
| 5-15-75 | 91 | 2710687 | .373 | .459 |
| 6-15-75 | 122 | 3796154 | .500 | .643 |
| 7-15-75 | 152 | 4630842 | .623 | .784 |
| 8-15-75 | 183 | 5563992 | .750 | .942 |
| 9-15-75 | 214 | 5770224 | .877 | .977 |
| 10-15-75 | 244 | 5907516 | 1.000 | 1.000 |

FORM 12

Y AXIS (COST COMPLETION)

Sample #17 Contract: DAAA09-75-C-0048
Regression Form: $Y = A + BX + CX^2 + DX^3$
 $A = -.17370$, $B = 1.65171$, $C = .41137$, $D = -.89208$
Coefficient of Multiple Determination: .99815
Coefficient of Variation: .02414



X AXIS (TIME COMPLETION)

SAMPLE: #18

CONTRACTOR: REDM Corp.

CONTRACT NO: DAAA09-72-C-0047

CONTRACT TYPE: FFP (Progress Payments)

COMMODITY: Fuze, PD, M524A6 MPTS

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 9- 1-72 | START | | | |
| 9-30-72 | 30 | \$ 102477 | .058 | .082 |
| 11- 4-72 | 65 | 272390 | .125 | .218 |
| 12- 9-72 | 100 | 508866 | .193 | .408 |
| 1-31-73 | 153 | 515957 | .295 | .413 |
| 2-28-73 | 181 | 619197 | .349 | .496 |
| 3-31-73 | 212 | 772989 | .409 | .619 |
| 4-30-73 | 242 | 921085 | .467 | .738 |
| 5-31-73 | 273 | 978045 | .527 | .783 |
| 6-30-73 | 303 | 1091965 | .585 | .875 |
| 8-31-73 | 365 | 1127565 | .705 | .903 |
| 10-31-73 | 426 | 1154827 | .822 | .925 |
| 11-30-73 | 456 | 1204995 | .880 | .965 |
| 1-31-74 | 518 | 1248339 | 1.000 | 1.000 |

FORM 11

Y AXIS (COST COMPLETION)

Sample #18 Contract: DAAA09-72-C-0047
 Regression Form: $Y = A + BX + CX^2$
 $A = -.02445$, $B = 2.03326$, $C = -1.01965$
 Coefficient of Multiple Determination: .97927
 Coefficient of Variation: .07320

1.250 +

1.125 +

1.000 +

.875 +

.750 +

.625 +

.500 +

.375 +

.250 +

.125 +

.120

.240

.360

.480

.600

.720

.840

.960

X AXIS (TIME COMPLETION)

SAMPLE: #19

CONTRACTOR: Gearhart Owen Industries CONTRACT NO: DAAA09-73-C-0187

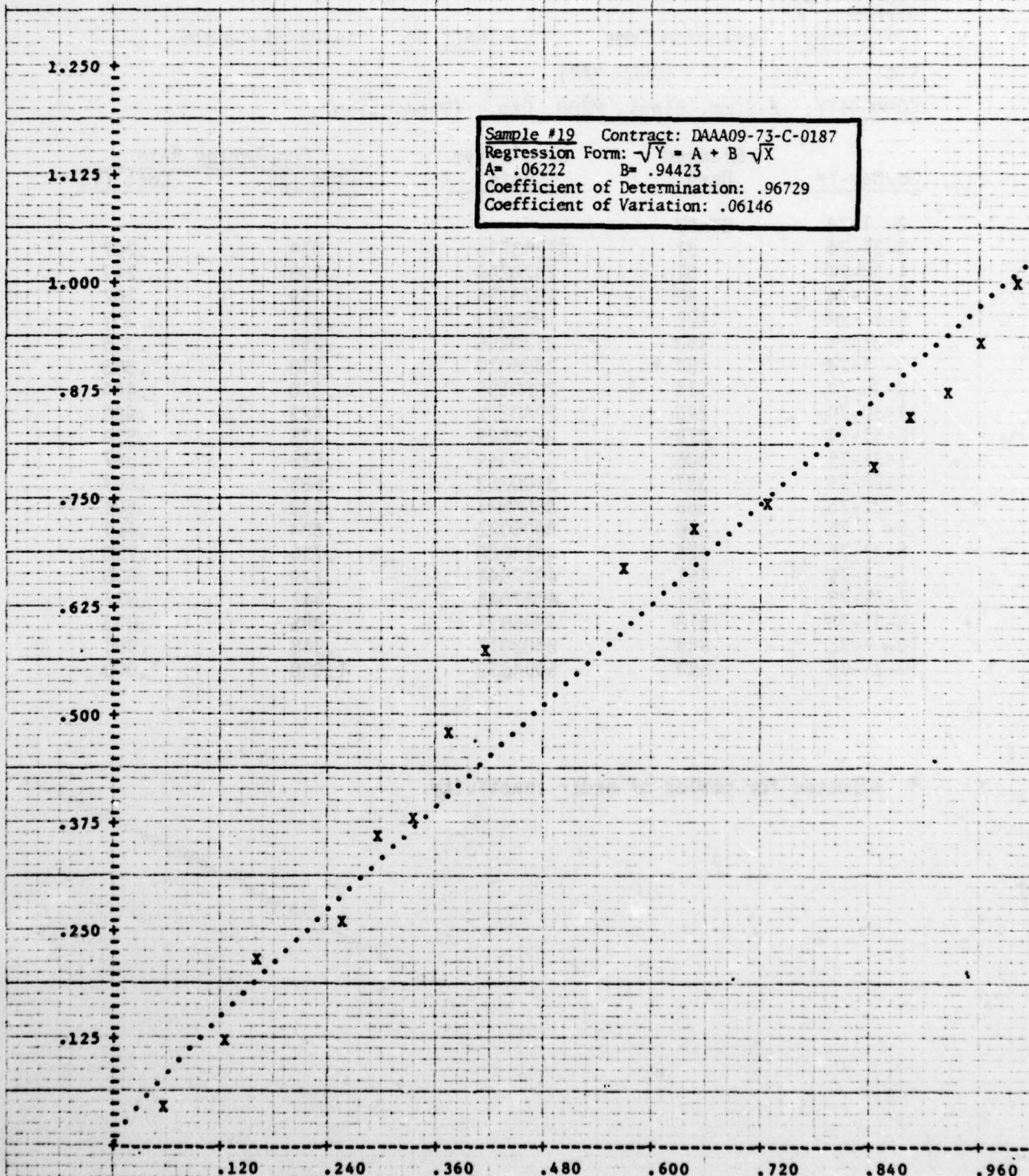
CONTRACT TYPE: FFP (Progress Payments)

COMMODITY: Cartridge Igniter M285

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 2-15-73 | AWARD | | | |
| 3-28-73 | 42 | \$ 37089 | .054 | .045 |
| 5-20-73 | 95 | 102596 | .123 | .123 |
| 6-17-73 | 123 | 180027 | .159 | .217 |
| 8-31-73 | 198 | 217503 | .255 | .262 |
| 9-30-73 | 228 | 300307 | .294 | .361 |
| 10-31-73 | 259 | 317709 | .334 | .382 |
| 11-30-73 | 289 | 399090 | .373 | .480 |
| 12-31-73 | 320 | 478401 | .413 | .576 |
| 4-30-74 | 440 | 557710 | .568 | .671 |
| 6-30-74 | 501 | 595658 | .646 | .717 |
| 8-31-74 | 563 | 619222 | .726 | .745 |
| 11-30-74 | 654 | 655122 | .844 | .788 |
| 12-31-74 | 685 | 703464 | .884 | .846 |
| 1-31-75 | 716 | 726930 | .924 | .874 |
| 2-28-75 | 744 | 774482 | .960 | .932 |
| 3-31-75 | 775 | 831255 | 1.000 | 1.000 |

FORM 8

Y AXIS (COST COMPLETION)



X AXIS (TIME COMPLETION)

SAMPLE: #20

CONTRACTOR: Remington Arms

CONTRACT NO: DAAA09-71-C-0316

CONTRACT TYPE: CPIX (GOCO AAP)

COMMODITY: 5.56mm, Blank, M200, Ctn. (Production)

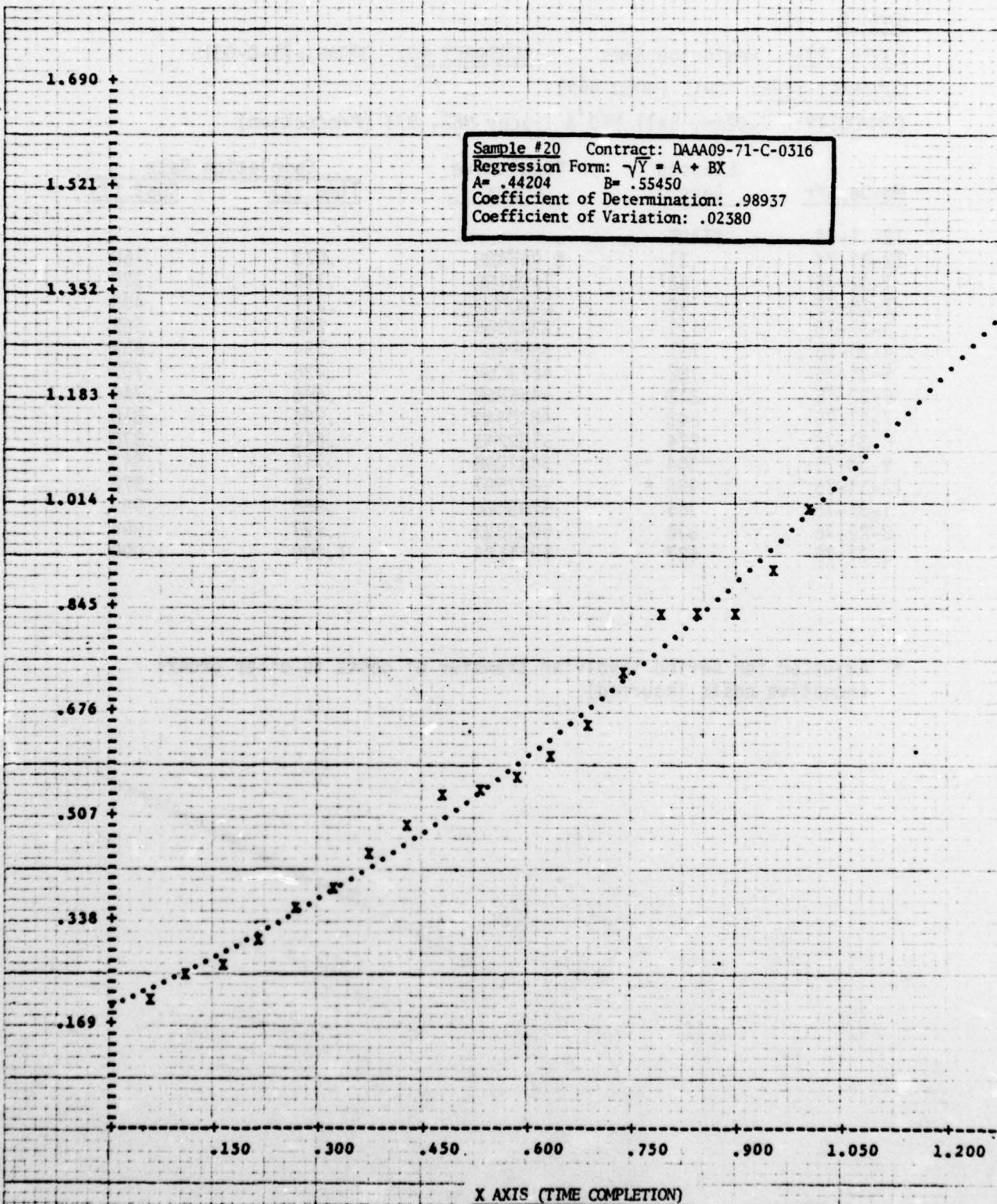
| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 3- 1-74 | START | | | |
| 3-31-74 | 31 | \$1243776 | .054 | .207 |
| 4-30-74 | 61 | 1478246 | .105 | .247 |
| 5-31-74 | 92 | 1573274 | .159 | .262 |
| 6-30-74 | 122 | 1818033 | .211 | .303 |
| 7-31-74 | 153 | 2130296 | .264 | .355 |
| 10- 1-74 | 184 * | 2326029 | .318 | .388 |
| 10-30-74 | 214 | 2660156 | .370 | .444 |
| 11-30-74 | 245 | 2940272 | .423 | .490 |
| 12-31-74 | 275 | 3226665 | .475 | .538 |
| 1-31-75 | 306 | 3279349 | .528 | .547 |
| 2-28-75 | 337 | 3400252 | .582 | .567 |
| 3-31-75 | 365 | 3604511 | .630 | .601 |
| 5- 1-75 | 396 | 3905022 | .684 | .651 |
| 5-31-75 | 426 | 4414808 | .736 | .736 |
| 7- 1-75 | 451 | 4977644 | .779 | .830 |
| 7-31-75 | 487 | 4987645 | .841 | .832 |
| 8-31-75 | 518 | 4995931 | .895 | .833 |
| 10- 1-75 | 549 | 5402017 | .948 | .901 |
| 10-31-75 | 579 | 5994830 | 1.000 | 1.000 |

* Adjusted for period of order inactivity.

FORM 6

Y AXIS (COST COMPLETION)

Sample #20 Contract: DAAA09-71-C-0316
 Regression Form: $\sqrt{Y} = A + BX$
 A = .44204 B = .55450
 Coefficient of Determination: .98937
 Coefficient of Variation: .02380



Q WIND LABORATORIES INC 615 0004

SAMPLE: #21

CONTRACTOR: Remington Arms

CONTRACT NO: DAAA09-71-C-0316

CONTRACT TYPE: CPIF (GOCO AAP)

COMMODITY: 7.62mm, Ball M80 & Tracer M62, 9/1 (Production)

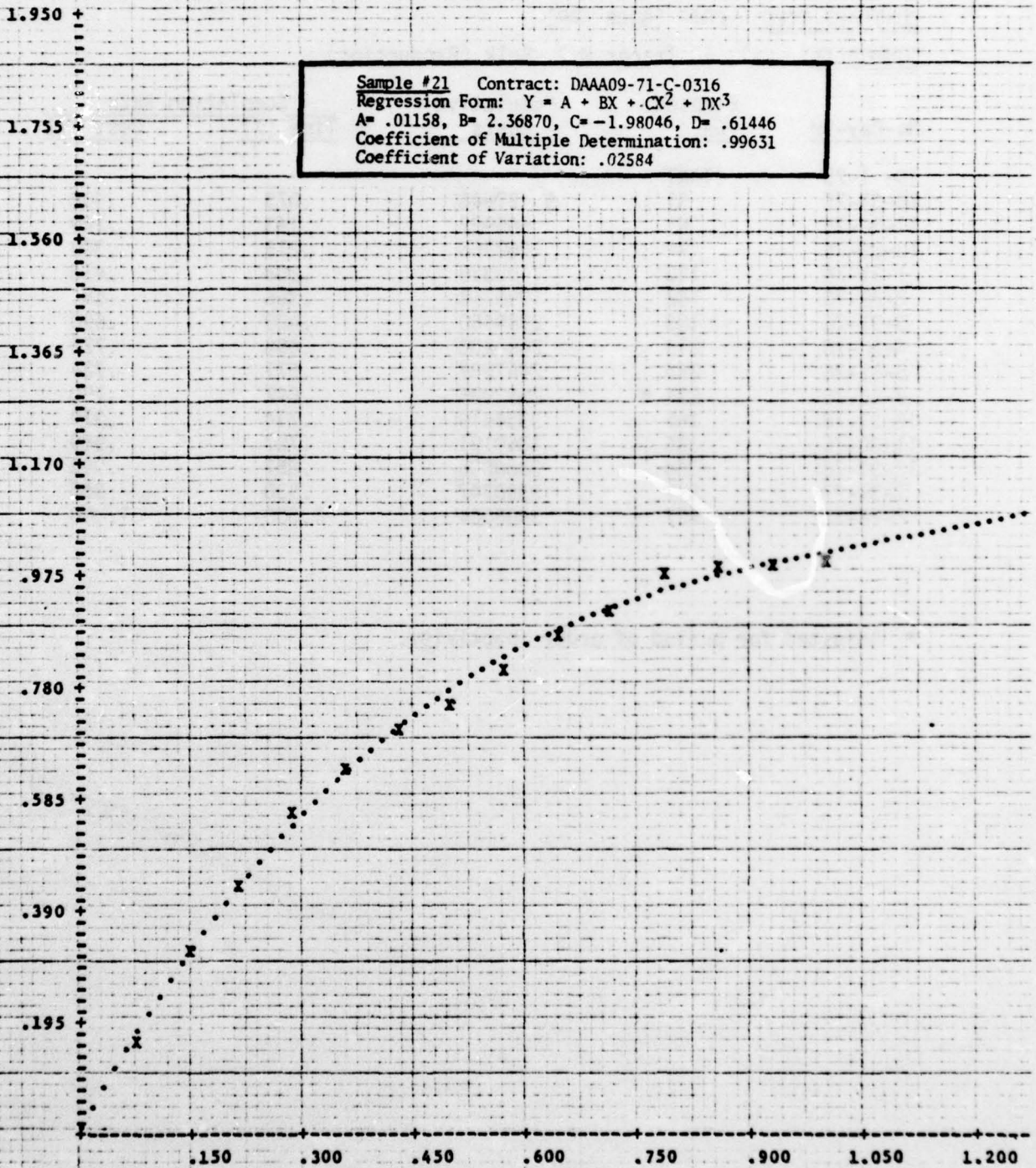
| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 12- 1-74 | START | | | |
| 12-31-74 | 31 | \$ 955486 | .073 | .160 |
| 1-31-75 | 62 | 1906105 | .145 | .320 |
| 2-28-75 | 90 | 2580061 | .211 | .433 |
| 3-31-75 | 121 | 3348565 | .283 | .562 |
| 4-30-75 | 151 | 3809452 | .354 | .639 |
| 5-31-75 | 182 | 4213568 | .426 | .707 |
| 6-30-75 | 212 | 4466968 | .496 | .749 |
| 7-31-75 | 243 | 4830949 | .596 | .810 |
| 8-31-75 | 274 | 5189243 | .642 | .870 |
| 9-30-75 | 304 | 5441298 | .712 | .913 |
| 12-31-75 | 335 * | 5827587 | .785 | .978 |
| 1-31-76 | 365 | 5893160 | .855 | .989 |
| 2-29-76 | 396 | 5924833 | .927 | .994 |
| 3-31-76 | 427 | 5961584 | 1.000 | 1.000 |

* Adjusted for period involving transfer of costs to other orders (negative costs incurred).

FORM 12

Y AXIS (COST COMPLETION)

Sample #21 Contract: DAAA09-71-C-0316
 Regression Form: $Y = A + BX + CX^2 + DX^3$
 $A = .01158, B = 2.36870, C = -1.98046, D = .61446$
 Coefficient of Multiple Determination: .99631
 Coefficient of Variation: .02584



X AXIS (TIME COMPLETION)

SAMPLE: #22

CONTRACTOR: Remington Arms

CONTRACT NO: DAAA09-71-C-0316

CONTRACT TYPE: CPIF (GOCO AAP)

COMMODITY: Cal .50 Tracer M17, Bulk (Production)

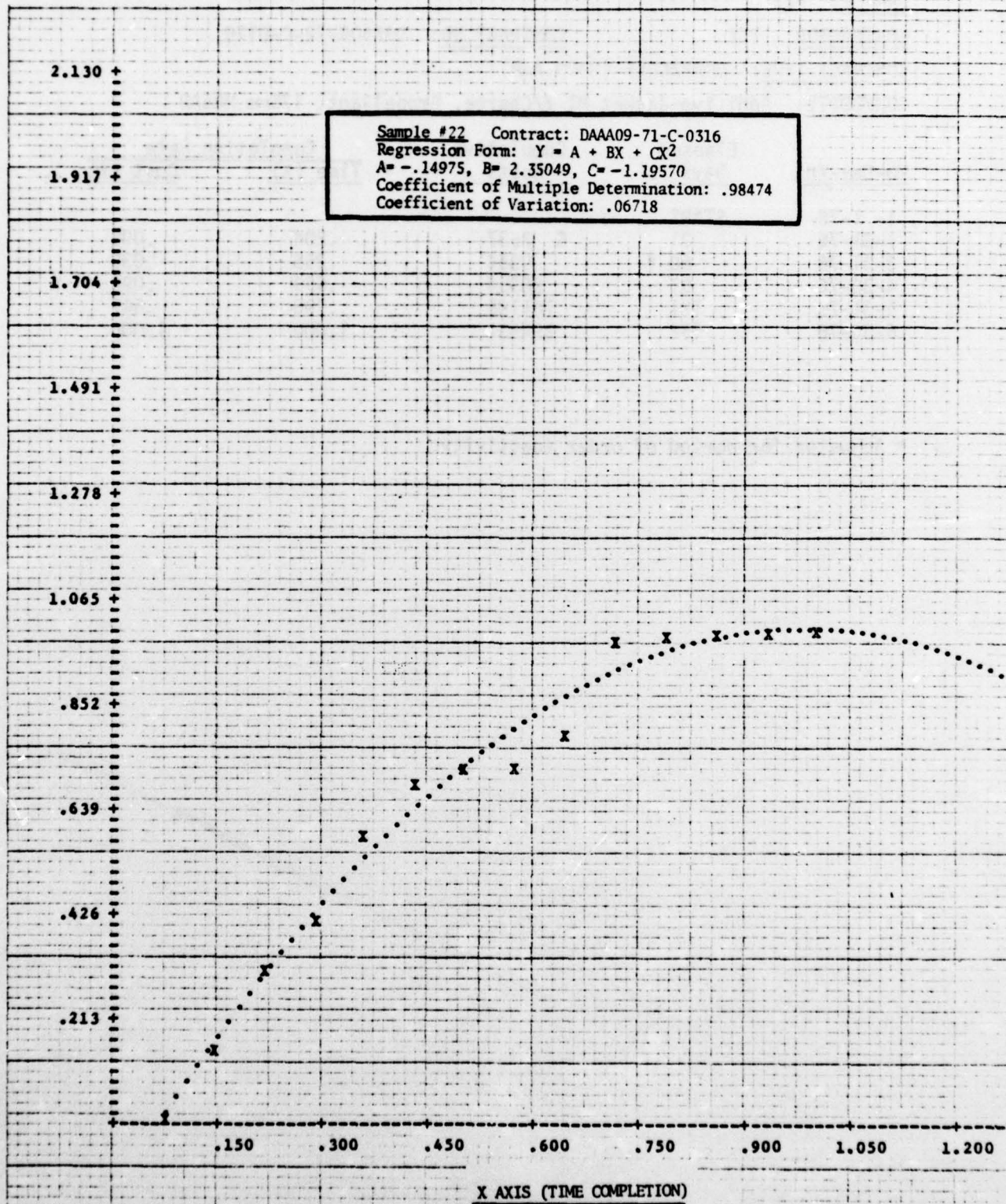
| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 10- 1-75 | START | | | |
| 10-31-75 | 31 | \$ 27648 | .073 | .008 |
| 11-30-75 | 61 | 505922 | .143 | .149 |
| 12-31-75 | 92 | 1052755 | .215 | .309 |
| 1-31-76 | 123 | 1408330 | .288 | .413 |
| 2-29-76 | 152 | 1990718 | .356 | .584 |
| 3-31-76 | 183 | 2349660 | .429 | .690 |
| 4-30-76 | 213 | 2460200 | .499 | .722 |
| 5-31-76 | 244 | 2467587 | .571 | .724 |
| 9-30-76 | 274 * | 2692285 | .642 | .790 |
| 10-31-76 | 305 | 3334610 | .714 | .979 |
| 11-30-76 | 336 | 3369191 | .787 | .989 |
| 12-31-76 | 366 | 3380806 | .857 | .993 |
| 1-31-77 | 397 | 3390747 | .930 | .996 |
| 2-28-77 | 427 | 3406064 | 1.000 | 1.000 |

* Adjusted for period of order inactivity.

FORM 11

Y AXIS (COST COMPLETION)

Sample #22 Contract: DAAA09-71-C-0316
 Regression Form: $Y = A + BX + CX^2$
 $A = -.14975$, $B = 2.35049$, $C = -1.19570$
 Coefficient of Multiple Determination: .98474
 Coefficient of Variation: .06718



SAMPLE: #23

CONTRACTOR: ICI

CONTRACT NO: DAAA09-72-C-0170

CONTRACT TYPE: CPAF/CPFF (GOCO AAP)

COMMODITY: Additive Jacket M1 f/Charge, Propellant, 175mm M86A2

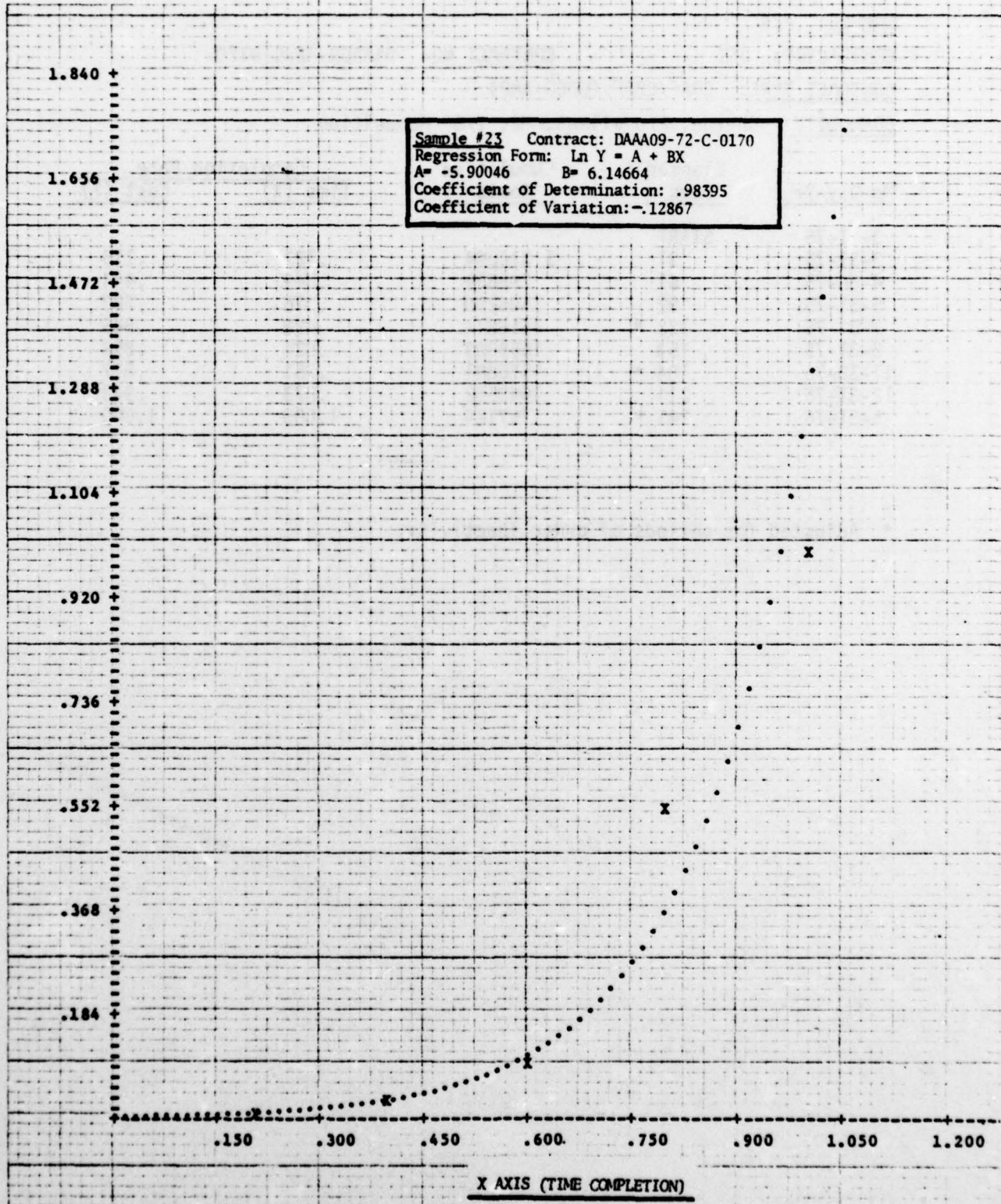
| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 1- 1-76 | START | | | |
| 1-31-76 | 31 | \$ 2537 | .204 | .009 |
| 3-31-76 | 60 * | 9354 | .395 | .032 |
| 4-30-76 | 91 | 28354 | .599 | .096 |
| 5-31-76 | 121 | 161185 | .796 | .547 |
| 6-30-76 | 152 | 294531 | 1.000 | 1.000 |

* Adjusted for period of order inactivity.

FORM 3

Y AXIS (COST COMPLETION)

Sample #23 Contract: DAAA09-72-C-0170
Regression Form: $\ln Y = A + BX$
A = -5.90046 B = 6.14664
Coefficient of Determination: .98395
Coefficient of Variation: -.12867



SAMPLE: #24

CONTRACTOR: ICI

CONTRACT NO: DAAA09-72-C-0170

CONTRACT TYPE: CPAF/CPFF (GOCO AAP)

COMMODITY: Charge, Propellant, M2, f/8" Ammunition

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 3- 1-75 | START | | | |
| 3-31-75 | 31 | \$ 314044 | .127 | .175 |
| 4-30-75 | 61 | 798359 | .249 | .444 |
| 5-31-75 | 92 | 1406290 | .376 | .783 |
| 7-31-75 | 122 * | 1518811 | .498 | .845 |
| 8-31-75 | 153 | 1559303 | .624 | .868 |
| 11-30-75 | 184 * | 1576881 | .751 | .877 |
| 12-31-75 | 214 | 1693562 | .873 | .942 |
| 5-31-76 | 245 * | 1797124 | 1.000 | 1.000 |

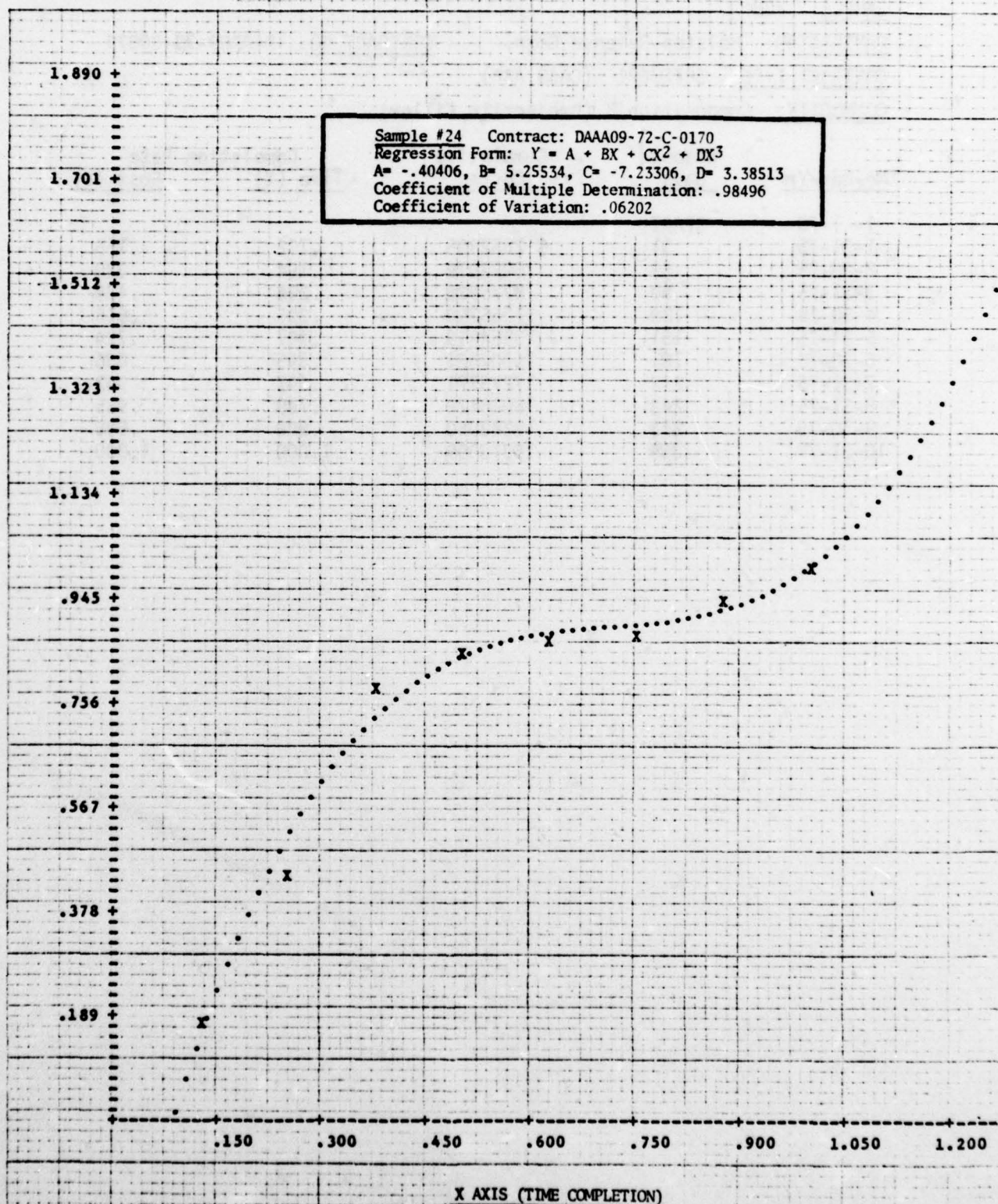
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FORM 12

Y AXIS (COST COMPLETION)



SAMPLE: #25

CONTRACTOR: Holston Defense Corp.

CONTRACT NO: DAAA09-73-C0079

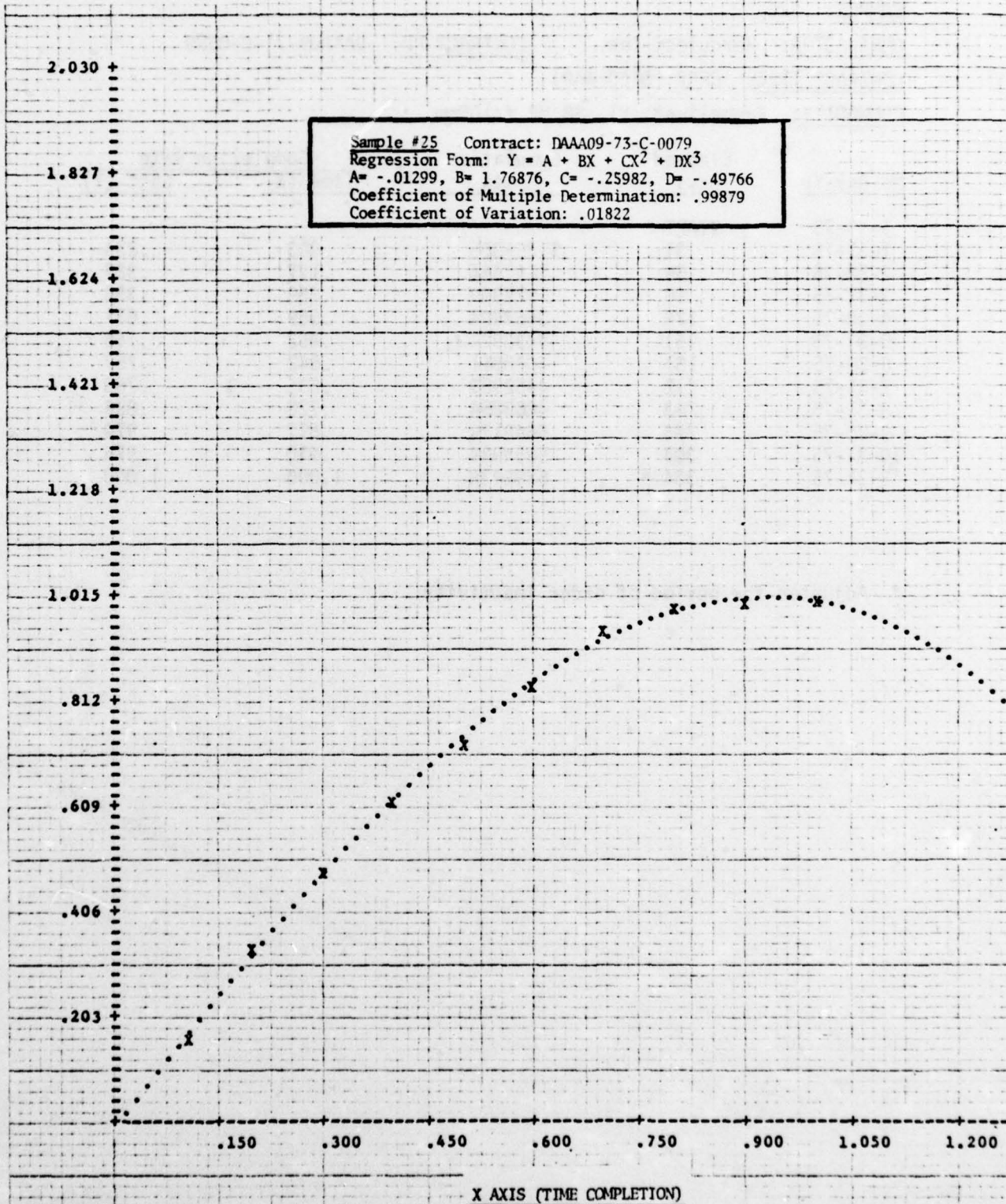
CONTRACT TYPE: CPFF/CPIF (GOCO AAP)

COMMODITY: Composition B (Projectile Filler)

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 1- 1-75 | START | | | |
| 1-31-75 | 31 | \$ 2852395 | .102 | .156 |
| 2-28-75 | 59 | 6027019 | .194 | .329 |
| 3-31-75 | 90 | 8775925 | .296 | .479 |
| 4-30-75 | 120 | 11255700 | .395 | .615 |
| 5-31-75 | 151 | 13264919 | .497 | .724 |
| 6-30-75 | 181 | 15307671 | .595 | .836 |
| 7-31-75 | 212 | 17275771 | .697 | .943 |
| 8-31-75 | 243 | 18030128 | .799 | .985 |
| 9-30-75 | 273 | 18243060 | .898 | .996 |
| 10-31-75 | 304 | 18313099 | 1.000 | 1.000 |

FORM 12

Y AXIS (COST COMPLETION)



X AXIS (TIME COMPLETION)

SAMPLE: #26

CONTRACTOR: Hercules, Inc.

CONTRACT NO: DAAA09-71-C-0329

CONTRACT TYPE: CPFF (GOCO AAP)

COMMODITY: Propellant, M1, SB MP f/105mm

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 1- 1-75 | START | | | |
| 1-31-75 | 31 | \$1355355 | .093 | .234 |
| 2-28-75 | 59 | 1897564 | .177 | .327 |
| 3-31-75 | 90 | 1927909 | .269 | .332 |
| 4-30-75 | 120 | 3657804 | .359 | .631 |
| 5-31-75 | 151 | 4438924 | .452 | .766 |
| 6-30-75 | 181 | 4448811 | .542 | .767 |
| 7-31-75 | 212 | 4452983 | .635 | .768 |
| 8-31-75 | 243 | 4863854 | .728 | .839 |
| 9-30-75 | 273 | 5648174 | .817 | .974 |
| 10-31-75 | 304 | 5654924 | .910 | .975 |
| 12-31-75 | 334 * | 5798438 | 1.000 | 1.000 |

* Adjusted for period of order inactivity.

FORM 11

Y AXIS (COST COMPLETION)

Sample #26 Contract: DAAA09-71-C-0329
Regression Form: $Y = A + BX + CX^2$
A= .05394, B= 1.70508, C= -.76298
Coefficient of Multiple Determination: .95071
Coefficient of Variation: .09946

1.910 +

1.719 +

1.528 +

1.337 +

1.146 +

.955 +

.764 +

.573 +

.382 +

.191 +

.150

.300

.450

.600

.750

.900

1.050

1.200

X AXIS (TIME COMPLETION)

SAMPLE: #27

CONTRACTOR: Hercules, Inc.

CONTRACT NO: DAAA09-71-C-0329

CONTRACT TYPE: CPFF (GOCO AAP)

COMMODITY: Propellant, M1 SB MP f/155mm

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 1- 1-75 | START | | | |
| 1-31-75 | 31 | \$ 4201487 | .114 | .221 |
| 2-28-75 | 59 | 6843859 | .216 | .360 |
| 3-31-75 | 90 | 9519758 | .330 | .500 |
| 4-30-75 | 120 | 10690821 | .440 | .562 |
| 5-31-75 | 151 | 12928588 | .553 | .679 |
| 6-30-75 | 181 | 15315604 | .663 | .805 |
| 7-31-75 | 212 | 17524513 | .777 | .921 |
| 8-31-75 | 243 | 18852682 | .890 | .990 |
| 10-31-75 | 273 * | 19035873 | 1.000 | 1.000 |

* Adjusted for period of order inactivity.

FORM 8

Y AXIS (COST COMPLETION)

Sample #27 Contract: DAAA09-71-C-0329
 Regression Form: $\sqrt{Y} = A + B \sqrt{X}$
 A = .21277 B = .82326
 Coefficient of Determination: .98914
 Coefficient of Variation: .02573

1.920 +
 1.728 +
 1.536 +
 1.344 +
 1.152 +
 .960 +
 .768 +
 .576 +
 .384 +
 .192 +

.150 .300 .450 .600 .750 .900 1.050 1.200

X AXIS (TIME COMPLETION)

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6795

SAMPLE: #28

CONTRACTOR: Thiokol

CONTRACT NO: DAAA09-71-C-0265

CONTRACT TYPE: CPIF (GOCO AAP)

COMMODITY: Load, Assemble, Pack (LAP) 105mm M314A3

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 9- 1-75 | START | | | |
| 9-30-75 | 30 | \$150246 | .141 | .288 |
| 10-31-75 | 61 | 345227 | .286 | .662 |
| 11-30-75 | 91 | 377295 | .427 | .724 |
| 12-31-75 | 122 | 414027 | .573 | .794 |
| 4-30-76 | 153 * | 485769 | .718 | .932 |
| 5-31-76 | 182 | 518120 | .854 | .994 |
| 8-31-76 | 213 * | 521154 | 1.000 | 1.000 |

* Adjusted for periods of order inactivity.

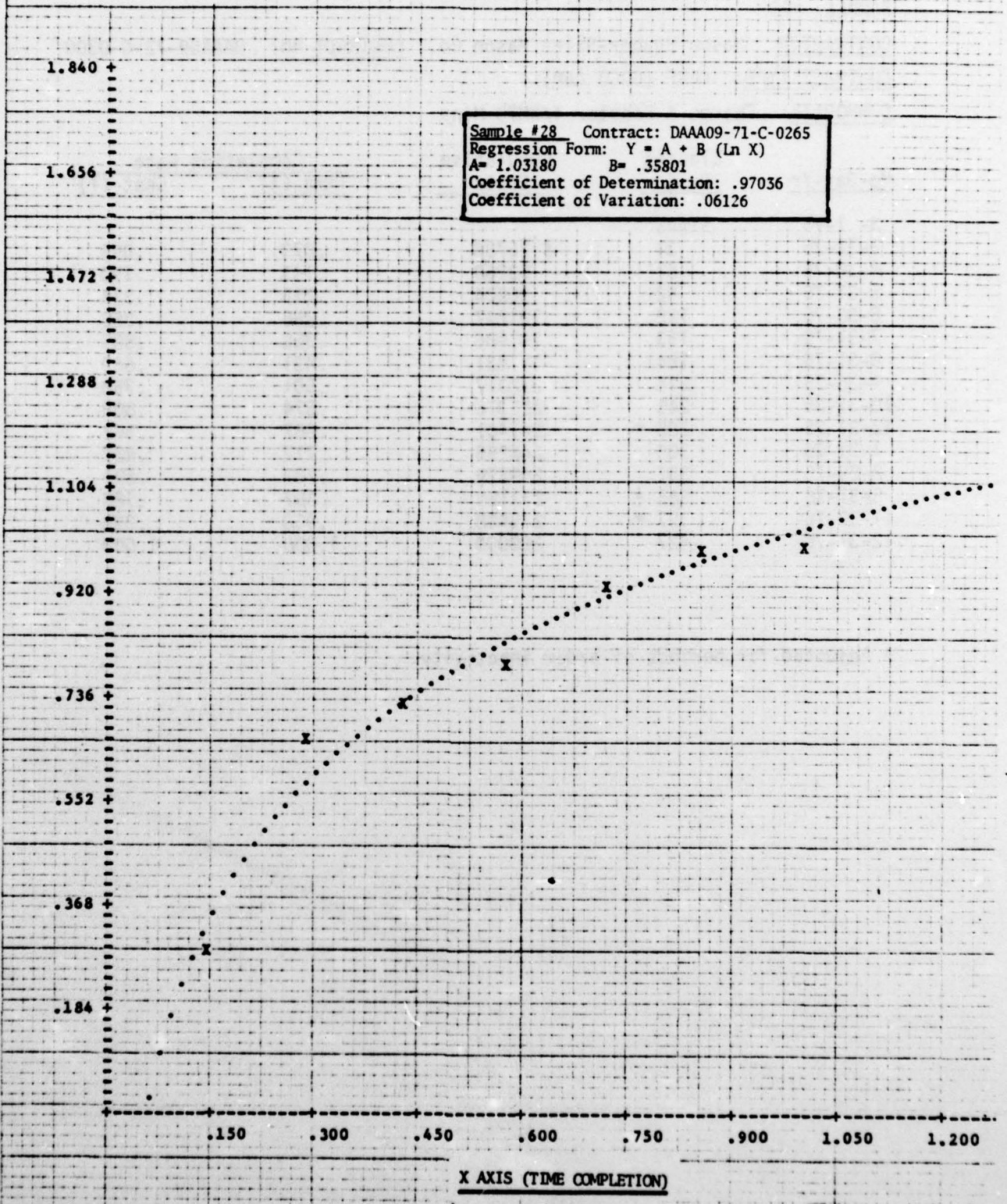
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FORM 2

Y AXIS (COST COMPLETION)

Sample #28 Contract: DAAA09-71-C-0265
Regression Form: $Y = A + B (\ln X)$
A= 1.03180 B= .35801
Coefficient of Determination: .97036
Coefficient of Variation: .06126



X AXIS (TIME COMPLETION)

SAMPLE: #29

CONTRACTOR: Mason Hanger-Silas Mason Co. CONTRACT NO: DAAA09-72-C-0300

CONTRACT TYPE: CPAF (GOCO AAP)

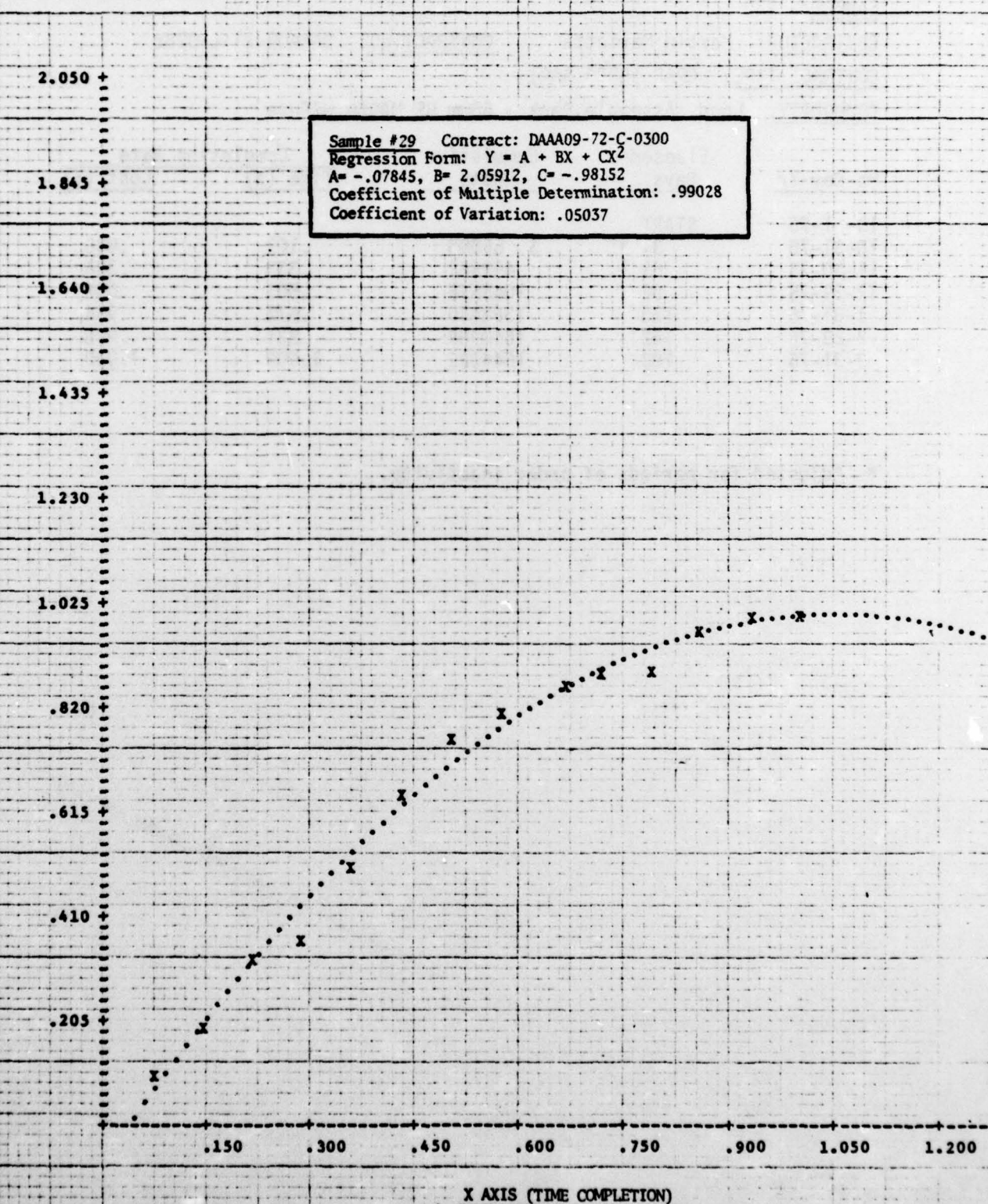
COMMODITY: Charge & Booster f/XM70 Mine

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 3- 1-75 | START | | | |
| 3-31-75 | 31 | \$ 26738 | .073 | .095 |
| 4-30-75 | 61 | 53260 | .143 | .190 |
| 5-31-75 | 92 | 90604 | .215 | .324 |
| 6-30-75 | 122 | 101247 | .286 | .362 |
| 7-31-75 | 153 | 141406 | .358 | .505 |
| 8-31-75 | 184 | 181831 | .431 | .649 |
| 9-30-75 | 214 | 212317 | .501 | .758 |
| 10-31-75 | 245 | 226376 | .574 | .808 |
| 12-31-75 | 285 * | 241401 | .667 | .862 |
| 1-31-76 | 306 | 248255 | .717 | .887 |
| 2-29-76 | 337 | 249579 | .789 | .891 |
| 8-31-76 | 366 * | 271159 | .857 | .968 |
| 11-30-76 | 397 * | 279488 | .930 | .998 |
| 12-31-76 | 427 | 280000 | 1.000 | 1.000 |

* Adjusted for periods of order inactivity.

FORM 11

Y AXIS (COST COMPLETION)



SAMPLE: #30

CONTRACTOR: Martin Marietta

CONTRACT NO: DAAA09-71-C-0288

CONTRACT TYPE: CPAF (GOCO AAP)

COMMODITY: Load, Assemble, Pack - 60mm HE M49A4 w/Fuze

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 10- 1-75 | START | | | |
| 10-31-75 | 31 * | \$ 65093 | .169 | .040 |
| 11-30-75 | 61 * | 499562 | .333 | .304 |
| 12-31-75 | 92 | 1045576 | .503 | .636 |
| 1-31-76 | 123 | 1568430 | .672 | .954 |
| 2-29-76 | 152 | 1640989 | .831 | .998 |
| 3-31-76 | 183 | 1644339 | 1.000 | 1.000 |

* Adjusted for periods of order inactivity.

FORM 2

Y AXIS (COST COMPLETION)

Sample #30 Contract: DAAA09-71-C-0288
 Regression Form: $Y = A + B (\ln X)$
 $A = 1.07349$ $B = .60496$
 Coefficient of Determination: .95834
 Coefficient of Variation: .14168

2.240 +

2.016 +

1.792 +

1.568 +

1.344 +

1.120 +

.896 +

.672 +

.448 +

.224 +

.150 .300 .450 .600 .750 .900 1.050 1.200

X AXIS (TIME COMPLETION)

SAMPLE: #31

CONTRACTOR: Day & Zimmerman

CONTRACT NO: DAAA09-71-C-0289

CONTRACT TYPE: CPAF (GOCO AAP)

COMMODITY: Projectile, 155mm M483

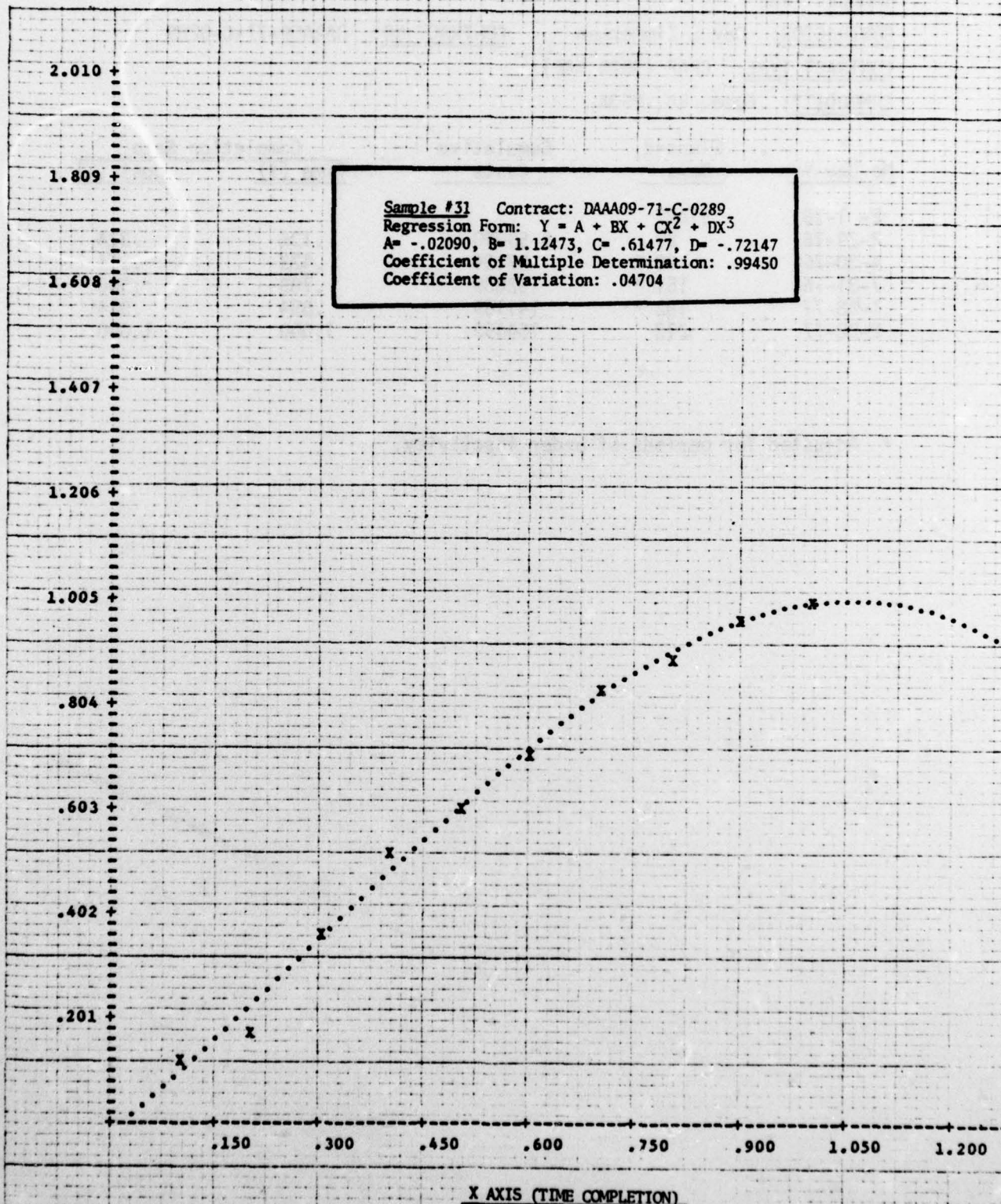
| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 6- 1-75 | START | | | |
| 6-30-75 | 30 | \$ 219275 | .098 | .118 |
| 7-31-75 | 61 | 320774 | .200 | .172 |
| 8-31-75 | 92 | 671894 | .302 | .361 |
| 11-30-75 | 122 * | 962995 | .400 | .518 |
| 12-31-75 | 153 | 1121166 | .502 | .603 |
| 1-30-76 | 183 | 1315192 | .600 | .707 |
| 3-31-76 | 214 * | 1547974 | .702 | .832 |
| 5- 1-76 | 245 | 1655963 | .803 | .890 |
| 5-31-76 | 274 | 1796820 | .898 | .966 |
| 7-31-76 | 305 * | 1860000 | 1.000 | 1.000 |

* Adjusted for periods of order inactivity.

FORM 12

Y AXIS (COST COMPLETION)

Sample #31 Contract: DAAA09-71-C-0289
Regression Form: $Y = A + BX + CX^2 + DX^3$
 $A = -.02090$, $B = 1.12473$, $C = .61477$, $D = -.72147$
Coefficient of Multiple Determination: .99450
Coefficient of Variation: .04704



SAMPLE: #32

CONTRACTOR: Day & Zimmerman

CONTRACT NO: DAAA09-71-C-0289

CONTRACT TYPE: CPAF (GOCO AAP)

COMMODITY: Fuze, BD, M534

| <u>Mo-Day-Yr</u> | <u>Elapsed Days</u> | <u>Cumulative Costs</u> | <u>Completion Rate</u> | |
|------------------|-------------------------|-----------------------------|------------------------|-----------------|
| | | | <u>Time (X)</u> | <u>Cost (Y)</u> |
| 2- 1-76 | START | | | |
| 2-29-76 | 29 | \$ 50000 | .136 | .324 |
| 4-30-76 | 90 * | 87134 | .423 | .564 |
| 7-31-76 | 151 * | 132889 | .709 | .860 |
| 1-28-77 | 182 * | 141169 | .854 | .914 |
| 2-28-77 | 213 | 154455 | 1.000 | 1.000 |

* Adjusted for periods of order inactivity.

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FORM 8

Y AXIS (COST COMPLETION)

1.800 +

1.620 +

1.440 +

1.260 +

1.080 +

.900 +

.720 +

.540 +

.360 +

.180 +

Sample #32 Contract: DAAA09-71-C-0289
Regression Form: $\sqrt{Y} = A + B \sqrt{X}$
A = .30808 B = .70355
Coefficient of Determination: .99155
Coefficient of Variation: .02257

.150

.300

.450

.600

.750

.900

1.050

1.200

X AXIS (TIME COMPLETION)

1793

77

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| 13. ABSTRACT This study provides the results of analyzing cumulative cost incurred patterns on contracts representing a cross-section of Headquarters, US Army Armament Materiel Readiness Command (ARRCOM) commodity-oriented procurements. The study was performed to develop ARRCOM commodity-oriented termination liability table(s) as requested by Headquarters, US Army Materiel Development and Readiness Command. The study provides comparative regression plots for armament products, ammunition products, ARRCOM combined armament/ammunition products, along with the plot of the DOD Termination Liability Table currently being applied by ARRCOM. The termination liability table developed in the study is based upon the ARRCOM combined armament/ammunition products regression analysis. | | | |

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